Chignik River Smolt Enumeration Project Operational Plan, 2013

by

Adam St. Saviour

April 2013

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

This operational plan describes the procedures of the sockeye salmon *Oncorhynchus nerka* smolt monitoring and enumeration project conducted by the Alaska Department of Fish and Game (ADF&G) in the Chignik River system. The research is designed to estimate smolt population size and age structure, assess fish body condition, describe limnetic habitat conditions and forage base, collect samples for genetic stock identification, and provide data for the Chignik River preseason adult sockeye salmon forecast. The abundance of sockeye salmon smolt will be estimated using a rotary-screw trap array and mark-recapture techniques. Age structure of the population will be estimated from scales of sockeye salmon smolt collected at the traps. Limnology surveys will be conducted in Chignik and Black lakes each month from June to August to describe physical characteristics, nutrient availability, primary production, and zooplankton forage available to rearing juvenile sockeye salmon. Juvenile salmon habitat use will be examined by beach seining in the upper Chignik River system and near-shore marine environment. Findings from this project are vital for understanding effects of the commercial fishery and environmental changes occurring in the Chignik River system on the sockeye salmon population.

Key words: Sockeye salmon, smolt, *Oncorhynchus nerka*, Chignik River, limnology, mark-recapture, zooplankton

INTRODUCTION

Economically, sockeye salmon *Oncorhynchus nerka* are the most important commercial salmon species in the Chignik Management Area (CMA). The Chignik River system is the primary sockeye salmon producer in the CMA (Figure 1). Over the last 15 years, annual runs to the Chignik River have ranged from 1.5 to 4.5 million adult sockeye salmon (Anderson et al. *in press*). There are two rearing lakes in the Chignik system and two sockeye salmon runs distinct to each lake. Sockeye salmon that spawn in Black Lake and its tributaries return from about May through July, and those that spawn in Chignik Lake and its tributaries return from about July through September (Creelman et al. 2011). Smolt population abundance data, by age, has been collected annually since 1994. This project provides information on the Chignik River juvenile (smolt and fry) sockeye salmon population size and dynamics and the physical health of the smolt. Limnology data used for habitat assessment will also be collected as part of this project. Smolt population and limnology data will be used for evaluating current escapement goals, forecasting future adult returns, and estimating ocean survival.

GOAL

The project goal is to evaluate and document production trends of sockeye salmon smolt in the Chignik River system and collect limnology data to understand its rearing capacity.

OBJECTIVES

1. Estimate the total number of emigrating sockeye salmon smolt, by age class, from the Chignik River.
2. Describe sockeye salmon smolt emigration timing and growth characteristics (length, weight, and condition factor), by age class and stock.
3. Document juvenile salmon habitat use by beach seining Black Lake and Chignik Lagoon
4. Collect genetic samples from emigrating sockeye salmon smolt and fry caught in the trap and in Chignik Lagoon beach seine hauls for use in a stock separation study.
5. Describe the physical characteristics of Black and Chignik lakes, including temperature, dissolved oxygen, and light penetration profiles.
6. Describe the nutrient availability and primary productivity of Black and Chignik lakes.

7. Describe the zooplankton forage base available to juvenile sockeye salmon in Black and Chignik lakes.
8. Write a project summary report.

TASKS

1. Install, operate, and maintain a rotary screw smolt trap array to capture a portion of the sockeye salmon smolt outmigration.

   Target dates: April 27 through July 10.
2. Enumerate the daily smolt trap catch by species.
3. Collect weekly samples of 200 sockeye salmon smolt from the rotary screw trap array (40 smolt per day for five consecutive days) for age, weight, and length (AWL) data.
4. Collect genetic samples from all AWL sampled fish.
5. Perform weekly mark-recapture experiments by dyeing and releasing 3,000 (1,000 minimum) sockeye salmon to estimate trap efficiency and the total smolt outmigration. In conjunction with each mark-recapture experiment, a mark-retention/delayed mortality experiment will be conducted.
6. Collect physical data daily: air temperature, water temperature, relative water depth, cloud cover, trap revolutions per minute, and wind direction and velocity.
7. Collect limnology data monthly from each lake including physical parameters: water chemistry, clarity, temperature, dissolved oxygen, solar illuminance depth profiles, and water samples for biological parameters: nutrients, phytoplankton, and zooplankton
8. Beach seine in Chignik Lagoon and Black Lake to obtain sockeye salmon juveniles for AWL and genetics.
9. Take inventory and store equipment. Target date: July 15.
10. Publish the 2013 smolt project findings in an annual report. Final report due date: March 15, 2014.

SUPERVISION

Project Biologist, Adam St. Saviour – Fisheries Biologist II (PCN 11-1273)

Crew Lead, Kyle Shedd - Fisheries Biologist I (PCN 11-1426)

Crewmember, Kaarle Strailey – Fish and Wildlife Technician II (PCN 11-5191)

The crew leader will schedule daily tasks and will oversee and participate in all field operations regarding the smolt project. The crewmember will assist the crew leader in all assigned tasks and field operations. The Project Biologist will oversee the study, and provide logistical and technical support. All project members will work as a team to complete the project's goals. Technical or policy questions will be directed to the Project Biologist. The Chignik Area Management Biologist oversees and is responsible for all Alaska Department of Fish and Game (ADF&G) operations at Chignik. The smolt project research staff will work cooperatively with management staff and the public.

METHODS

SMOLT SAMPLING

Trap Installation

The traps will be constructed and installed following the guidelines in Appendix A1. Two rotary screw traps (1.5-m and 2.4-m cone diameters) will be positioned in the Chignik River at the same location as in previous years (56.257259 N 158.730213W; Figure 2). The traps will be marked with a safety light for boat traffic. The traps will be operated in tandem perpendicular to the stream flow and anchored to shore. The water velocity should be approximately 5 ft/s (~1.5 m/s) at the trap location to provide a trap operating speed of about 5-8 revolutions per minute (rpm). To reduce smolt avoidance, each trap will be relocated laterally (as the river flow fluctuates), to fish as far offshore as possible without jeopardizing safety or equipment.

Smolt Trapping and Enumeration

The screw traps will operate continuously throughout the season. A trapping day will be defined as a 24-hour period from noon to noon, with the date corresponding to the calendar date of the first 12-hour period. Time will be recorded in military (24-hour) format. During periods of high outmigration, the traps will be checked every two to three hours from dusk to dawn, and approximately every six hours during the day, in order to avoid excessive mortality. This may require the crew to remain overnight at the smolt traps. Regardless of outmigration intensity, the traps will be checked, cleaned, and emptied daily at noon. During periods of decreased outmigration intensity, a general rule is to check the traps at noon, 1800, 2200, and between 0600 and 0800 hrs. It is extremely important to monitor the traps closely because smolt migration rates are variable and unpredictable: excessive mortality can occur quickly if smolt are crowded in the trap. The traps will be kept clear of debris, as increased flows and detritus may cause death or injury to captured smolt.

Each time the traps are checked, all species will be identified and counted. Various identification keys (e.g., Pollard et al. 1997; Appendix B1) will be available and care will be taken to ensure proper identification. If identification by external characters proves difficult, a small number of fish will be sacrificed and internal characters will be examined. All fish of each species will be counted using a hand counter to facilitate accuracy. Each time the trap is checked, all counts, including mortalities, will be recorded on the DAILY SMOLT CATCH REPORTING FORM (Figure 3). If it becomes necessary to count continuously because of high fish abundance, the tally will end for each species at the end of each hour. The data will be recorded, and a new tally will begin for the next hour. All counts will be summarized in the SOCKEYE SALMON SMOLT REPORTING FORM (Figure 4) and in two spreadsheets, 2013_appendices and 2013_inseason, on the project laptop on a daily basis.

If direct counting becomes impossible because of high smolt catches, it will be necessary to estimate the trap catch using the catch-weight method. The crew will be prepared to estimate the catch using this method well before large migrations begin because there is no preparation time when catch numbers become large. It may not be necessary to use the catch-weight method on both traps simultaneously; it is desirable to count individual fish when possible. It is also desirable to keep an individual tally for each trap during catch-weight enumeration. The methods for the catch-weight estimation technique are

1. A sample of approximately 150 fish will be dipnetted from the trap, and enumerated, by species, into a bucket; any marked fish will be noted. This sample should be representative of the fish in the trap.
2. Wet and tare the empty catch-weight net. Add the enumerated sample to the net. This weight will be the reference weight for the next samples. The data will be recorded in a field notebook and the fish will then be released.
3. Subsequent samples will be taken from the trap(s). The weight of these samples will be measured and recorded, and the fish will be released.
4. A new reference weight will be taken every 10^{th} sample or earlier if size or species compositions obviously change.
5. These data will be transferred to the CATCH-WEIGHT WORKSHEET (Figure 5) when passage rates slow down.

Any data generated by this method will be clearly marked on the data sheets.

Smolt Age, Weight, and Length Sampling

A sample of 40 sockeye salmon smolt will be collected for five consecutive days per statistical week and sampled for AWL data and entered into the Rugged Digital Assistant (RDA). (Appendix C1 through C5). All smolt sampling data will reflect the sampling day in which the fish were captured, and samples will not be mixed between days. For example, smolt collected on Friday night and Saturday morning will be counted as Friday's fish, even though sample processing may occur on Saturday afternoon. If less than 40 sockeye salmon smolt are captured in a day, all available smolt will be sampled for AWL data. If more than 40 smolt are captured, a sample of smolt will be collected at each check throughout the 24-hr sampling day and held in an instream live box. The number of fish held for sampling at each check will be proportional to the migration strength. At the end of the sampling day, 40 smolt will be randomly collected from the live box and sampled. The remaining smolt will be released. It is important that the smolt sample be representative of the entire night's migration. These data are used to reconstruct the age class components of the emigration, and smolt of different sizes and ages may travel in separate schools throughout the night.

The age of the sampled smolt will be estimated post-season by interpreting the growth patterns on their scales following the methods and notation of Koo (1962).

Genetic Sampling

All AWL-sampled sockeye salmon smolt will have tissue samples taken for paired (AWL and genetics) DNA analysis. The methods for sample collection are outlined in Appendix D1. The sample procedures in Appendix D1 are written for the non-lethal and lethal sampling of smolt; both are used. Fill the pre-labeled vials with ethanol just prior to sampling.

Sockeye fry will also be collected for genetic sampling. Twenty five sockeye fry will be collected for five consecutive nights per week. If there is less than twenty five fry, keep what is available. The collected sample will be lethally dosed with MS-222 and transferred to 125 mL poly bottle containing ethanol. Record the date, number of samples, and collector(s) initials on the label.

Genetic samples should not exceed one third of the volume of the containers, and will be refreshed once after the initial 24 hours of storage. Record the number of smolt and fry collected per day into a spreadsheet and submit it to the project biologist upon completion of the sampling season. The samples will be shipped to the ADF&G Gene Conservation Laboratory in Anchorage for processing at the end of the season.

Mark-Recapture Experiments

The Chignik River sockeye salmon smolt population size will be estimated using methods described in Carlson et al. (1998). Trap efficiency estimates will be made a minimum of once per week to estimate the number of sockeye salmon smolt emigrating from the Chignik River, or more frequently if the trap is moved.

The trap efficiency *E* is calculated by

$$E_h = \frac{m_h + 1}{(M_h + 1)}, \tag{1}$$

where

h = stratum or time period index (release event paired with a recovery period),

M_h = the total number of marked releases in stratum *h*,

and

m_h = the total number of marked recaptures in stratum *h*.

The approximately unbiased estimator of the total population within each stratum ($\hat{U}_h$) is calculated by

$$\hat{U}_h = \frac{u_h(M_h + 1)}{m_h + 1}, \tag{2}$$

where

u_h = the number of unmarked smolts captured in stratum.

Variance is estimated by

$$v(\hat{U}_h) = \frac{(M_h + 1)(u_h + m_h + 1)(M_h - m_h)u_h}{(m_h + 1)^2(m_h + 2)}. \tag{3}$$

The estimate of $\hat{U}$ for all strata combined is estimated by

$$\hat{U} = \sum_{h=1}^{L} \hat{U}_h, \tag{4}$$

where *L* is the number of strata. Variance of $\hat{U}$ is estimated by

$$v\left(\hat{U}\right) = \sum_{h=1}^{L} v\left(\hat{U}_h\right), \tag{5}$$

and 95% confidence intervals are estimated from

$$\hat{U} \pm 1.96\sqrt{v\left(\hat{U}\right)}, \tag{6}$$

which assumes that $\hat{U}$ is asymptotically normally distributed.

Bismarck Brown Y dye will be used to mark a sample of fish. The marked fish will be transported 1.3 km upstream of the trap to the release site (Figure 2). The release site is a cross section of river aligned with a small creek entering on the north side of the river, just upstream of a rock bluff. All smolt caught in the trap will be examined for marks, unless high catch volumes require the use of the catch-weight method. The proportion of recaptured fish will be used to estimate the proportion of the total emigration that is captured in the trap. The assumptions for mark-recapture experiments are:

1. Mortality rates are equal between marked and unmarked fish,
2. All recaptured fish are recognized as such,
3. All marked fish do not lose their marks, and
4. Marked and unmarked fish behave similarly (Carlson et al. 1998).

Every effort will be made to conform to these assumptions. The marking process can be very stressful for smolt, and care will be taken to avoid stressing the marked fish. The primary causes of mortality are excessive handling, high water temperatures, low levels of dissolved oxygen, and over-exposure to dye. The marked smolt will be released into the river at a point far enough upstream to ensure mixing with the unmarked population at a time when the migration for the evening is imminent.

Mark-recapture events will occur at least once per stat week (Appendix C3). If the overall workload and scheduling allow, and enough smolt can be captured, trap efficiency estimates will be made every five days.

The following methods will be used for marking and releasing smolt:

1. All data will be recorded on the SMOLT DYE RELEASE FORM (Figure 6).
2. Every five to seven days, a sample of approximately 1,000 to 3,000 sockeye salmon smolt will be collected for marking. If run strength is not sufficient to capture all the smolt in one day, smolt will be held in an instream live box for up to three days and a running count will be kept on a tally board. After the third evening, all smolt collected will be marked. Marked fish will not be sampled for AWL information.
3. The fish will be transferred from the instream live box to two 24-gallon marking containers. The containers will then be covered. A water pump will be used to gently exchange the water in the containers. The smolt will be allowed to rest in the container for at least 30 minutes. The pump hoses should be removed from the containers when pumps are not in use to prevent siphoning and subsequent draining.

4. The circulation pumps will be turned off, and a solution of 4.6 g of Bismarck Brown Y dye will be dissolved in each container. Three aerator units will be placed in the marking containers and will operate continuously during the dyeing period. After 15 minutes in the dye, the pump will be restarted and the containers will be flushed with fresh water. The dye solution should be extremely dilute after 20 minutes of flushing.
5. Following the dye treatment, the containers will be flushed with fresh water for a minimum of 90 minutes. Smolt displaying abnormal behavior will be removed from the experiment and released downstream of the traps.
6. Smolt showing normal behavior will be dipnetted from the recovery containers (final count noted), transferred to six 5-gallon buckets equipped with aerators, and transported upstream to the release site (Figure 2). At the release site, the smolt will be evenly distributed across the stream by slowly pouring the smolt out of the 5-gallon buckets. The boat should be operated in reverse and smolt released from the bow to prevent propeller-wash mortality or injury. The dye treatment and recovery process should be timed so that the release takes place at approximately 2300 hours.
7. The smolt trap will be closely monitored for recaptured marked fish beginning the day of release and continue through the next marking event. The number of marked fish will be observed and recorded on the DAILY SMOLT CATCH REPORTING FORM (Figure 3), the SOCKEYE SALMON SMOLT REPORTING FORM (Figure 4), and the in_season spreadsheet. The number of smolt examined will equal the number of marked smolt plus the number of unmarked smolt caught each day. The daily smolt catch will not include marked smolt, since these fish have been previously counted when they were collected to be marked.
8. In the event that it is necessary to use the catch-weight method to count smolt during a dye test period, the number of fish examined for marks will be the number of fish counted in the reference weight samples only. The total number of marked fish recovered will be extrapolated from the catch-weight method. Data generated from the catch-weight method will be clearly labeled.

Trapping conditions will be held constant between marking events. Modifications to the trap, including adjustments in lighting and trap location, will be made immediately before a marking event. If major changes in river flow rates or smolt migration patterns are noticed, a new marking event will follow as soon as possible. The Project Biologist will be consulted before any trap modifications are made unless immediate modifications are necessary to prevent loss of equipment or to prevent major smolt mortality. Any changes will be clearly documented in the daily log and in the comments section of the data forms.

Mark Retention/Delayed Mortality Experiments

A random subsample of 200 sockeye salmon smolt will be taken from the fish retained for marking for use in a combined mark retention and delayed mortality experiment. This experiment will be performed in conjunction with every dye test unless otherwise advised by the Project Biologist.

Before marking fish, 100 of the sockeye salmon smolt will be removed from the marking container and placed into a labeled, covered, and aerated 5-gal bucket. After the marking and recovery period, an additional 100 marked smolt will be placed in another labeled, covered, and

aerated 5-gal bucket. These two groups of fish will be handled the same as the fish that are marked and released, except they will not be released. The two buckets will be transported to the release site but retained. Be certain not to release these delayed mortality experiment fish. After releasing the marked-release group, return to the trap site and gently pour the two delayed mortality groups into their respective in-river live boxes (perforated totes). These smolt will be examined daily for mortalities. The number of mortalities from each group will be recorded on the DELAYED MORTALITY / MARK-RETENTION FORM (Figure 7). These smolt will be released at the beginning of a new mark-recapture test or after five days, whichever is first. The daily smolt catch will not include marked recaptures because these fish have already been counted.

Mark identification trials will occur each day of the mark-recapture stratum. The purpose of this test to evaluate the mark-recapture assumptions that all marks are retained and recognized. One crewmember will dip net approximately five smolt from both marked and unmarked live boxes and combine them in a bucket. This crew member will present a mixed sample of about five marked and unmarked smolt from this bucket to the examiner for one second. The examiner will determine how many smolt were marked and unmarked. The presenter will then carefully count the sample into a another bucket and record whether the examiner was correct. Once the true count is verified, the marked and unmarked fish will be separated and returned to their live boxes. Crewmembers will switch roles as presenter or examiner on a daily basis. It is desirable to mimic actual counting conditions as much as possible when conducting these trials; they should be performed under low light conditions. Results of this experiment will be recorded on the DELAYED MORTALITY / MARK-RETENTION FORM (Figure 7). Mortalities in the mark ID trial box are <u>not</u> recorded as delayed mortality.

If less than 1,000 of smolt are not captured over three days to perform mark-recapture experiments, then the sample-sizes used for delayed mortality and mark retention experiments may be reduced. The project biologist will be consulted prior to making this adjustment to the experimental design.

Physical Data

Air and water temperature, cloud cover, wind direction and velocity, trap rpm, and relative stream height will be measured once daily at noon throughout the season. This information will be recorded on the DAILY PHYSICAL DATA OBSERVATION FORM (Figure 8).

LIMNOLOGY SAMPLING

Station Placement and Sample Collection

Four limnology stations will be established in Chignik Lake (Figure 9), and one station will be established in Black Lake (Figure 10). The exact latitudes and longitudes of these stations were determined using a global positioning system (GPS) in prior years (Appendix E1). The sampling stations will be marked with a buoy at the same locations. A GPS will be used during buoy deployment and limnology sampling.

Sampling at Chignik and Black lakes will take place at monthly intervals (Appendix E2). Personnel experienced in running the Black River delta or a contracted guide from Chignik Lake Village will transport staff to Black Lake for monthly sampling. The skiff can be held in place at a sampling site by wrapping the bouy line around a cleat on the skiff. Temperature, dissolved oxygen, water clarity, and light penetration parameters will be measured at all stations. Water samples will be collected from a depth of 1 m and 29 m at stations two and four on Chignik

Lake. Water samples will be collected from the single station on Black Lake. Zooplankton samples will be taken from all stations.

Water Sampling

A Van Dorn sampler will be prepared and lowered to the desired sampling depth on a metered line. Collections will be taken from 1 and 29 m except for in Black Lake where only 1 m samples will be collected. A messenger attached to the line and held at surface will be released to trip the mechanism that will close the Van Dorn bottle at depth. The Van Dorn bottle will be pulled up to the surface and the contents emptied into a pre-cleaned, labeled, plastic carboy container. Each container will be rinsed with a small portion of sample water, which will be discarded prior to pouring the sample water into the carboy. This procedure will be repeated (without rinsing) until the carboy is 2/3 to 3/4 full. Any samples that contain sediment will be discarded and another sample will be collected. The carboys will be kept cold and dark in a cooler while in transport. The sampling depths, stations, and other appropriate comments will be recorded on the DETAILED LAKE SURVEY FORM (DLS form; Figure 12). Phytoplantkon samples will be collected during the water processing in the lab from the water samples taken (each station and depth).

Zooplankton Sampling

A 0.2-m diameter, 153-micron mesh, conical net will be used to collect all zooplankton samples with vertical tows. Prior to sampling, the bottom depth of each station will be determined by lowering a weighted, metered line. The collection basin and townet will be cleaned of any debris by rinsing with filtered deionized (DI) water. The plankton townet will be lowered at a steady rate, ensuring the weighted cod-end stays below the opening of the net, until the cod-end is approximately 1 m from the lake bottom or to the end of the towline (60 m). The net will be manually retrieved at a constant rate of ~0.5 m/second, stopping when the rim of the net is just above the water's surface. Contents of the net will be flushed with surface water into the collection cup while maintaining the rim above the water line. The townet will then be removed from the water and any remaining visible plankton will be washed into the cup with a deionized (DI) water wash bottle. The cup will be removed from the net and all sample contents will be emptied into a labeled, 125-ml sample bottle filled with 12.5 ml formalin (to yield a 10% buffered solution by volume). DI water will be used to rinse the collection cup and completely fill the sample bottle. The sample bottle will be capped and sealed with electrical tape to prevent the contents from leaking. Record the zooplankton tow depth on the DLS form (Figure 12).

The sample bottles will be stored at room temperature. Samples will be sent to Kodiak in a separate container from the water samples to prevent freezing the zooplankton samples. Zooplankton taxa will be identified and enumerated by the crew leader at the ADF&G Near Island Limnology Laboratory following established protocols (Koenings et al. 1987; Thomsen et al. 2002).

Light Measurement

Light levels will be measured from the bright side of the boat using an International Light LI-250A electronic photometer. The meter will be calibrated according to the manufacturer's instructions prior to use. Light readings, recorded in µmol photons m^{-2} s^{-1}, will begin just above the lake's surface (incidence). Measurements will then be taken just below the water's surface and at 0.5-m intervals, down to 5 m (i.e., 0.5, 1, 1.5,…5); then every meter (5, 6, 7, etc.)

thereafter until the light level reaches 0 µmol or the end of the cable is reached (30 m). Data will be recorded on the DLS form (Figure 12).

Temperature, Dissolved Oxygen, and Water Clarity

Water temperature (°C) and dissolved oxygen (DO; mg/l) levels will be measured at each station with a YSI Pro ODO meter. A handheld thermometer will be used to measure the air and surface water temperature to ensure the meter is working properly. The meter will be calibrated at the beginning of the season and examined each sampling day, according to the manufacturer's instructions. An incidence reading will be taken above the water's surface. The probe will then be lowered into the water and another reading will be taken directly below the water's surface. Subsequent measurements will be taken at 0.5-m intervals until the probe reaches 5 m. Readings will be taken every meter thereafter until the probe reaches 25 m, after which, measurements will be taken in 5-m increments. Temperature and DO readings will be recorded on the DLS form (Figure 12). Measurements will be taken until the probe is 1 m off the lake bottom or the depth exceeds the cord length (50 m).

Water clarity will be measured at each limnology station with a Secchi disk . Secchi depth will be measured on the shaded side of the boat. Polarized glasses will be removed to ensure consistency between sample sites. The Secchi disk will be lowered into the water on a metered line until it disappears from view, then pulled up until it reappears. The depth of the disk when it disappeared, the depth it reappeared, and the average of the two readings will be recorded. Results will be recorded on the DLS form (Figure 12).

Lab Setup

Filtration equipment (filter towers and flasks), graduated cylinders, burettes, pipettes, and carboys will be washed with phosphate-free soap and tap water in the labeled phosphate-free side of the sink. All equipment will then be rinsed three times with filtered (DI) water. All necessary bottles will be washed similarly with phosphate-free soap before sending them to the field. When stored, all containers will be covered with parafilm to keep dust out. The wastewater flasks do not need to be washed.

Before collecting any samples, reagents and necessary equipment required for filtration will be prepared and configured. A vacuum pump and filter apparatus will be set at 15-psi pump suction. Prior to use, the oil level of the vacuum pump will also be checked. Reagent preparation is outlined in Koenings et al. (1987) and Thomsen et al. (2002).

Water Sample Processing

Water samples will be kept refrigerated and processing will be completed within 24 hrs of field sampling. Processing directions are posted on the wall in the Chignik Field laboratory. Each sample will be processed separately. Poly bottles and graduated cylinders will be rinsed with a small portion of the water sample before filling to the desired amount. The water samples will be processed into the following subsamples:

1) Alkalinity and pH: Water samples will be measured for pH in 100 mL beaker using a Oakton 30 pH meter. Alkalinity will be assessed by acid titration. Measure 100 mL of the unfiltered refrigerated water sample into a 250 mL beaker. Place a stir bar into the 250 mL beaker and place the beaker on a magnetic stirrer. Place the pH meter probe into the beaker with the water sample. Fill the 10 mL buret with 0.02 N sulfuric acid (titrant).

Slowly add titrant to the water sample, stirring to mix the sample. Allow the sample to stabilize after additions, while monitoring the pH. Add titrant until a pH of 4.5 is reached and record the volume (mL) of titrant used and multiply this volume by 10 for total alkalinity. See Koenings et al. (1987) and Ruhl (2013) for more details. Measurements will be recorded on the DLS form (Figure 12).

2) Unfiltered frozen water nutrient content: Two 250-ml poly bottles will be filled with sample water and labeled 1 of 2 and 2 of 2. Space will be left to allow expansion due to freezing. The bottles will be appropriately labeled, sealed with electrical tape, and frozen for storage.
3) Phytoplankton: Water for phytoplankton will be taken from the surface (1 m) and at depth (29 m) samples from each station in each lake. A 100 ml sample of water will be poured into a labeled 125-ml poly bottle. Two ml of Lugol's acetate will be added to the sample and the solution will be mixed gently. The bottle will be appropriately labeled, sealed with electrical tape, and stored in the dark at room temperature.
4) Particulates: Four graduated cylinders will be filled with 1,000 mL each of sample water for each of the *two particulate samples per depth and site* (used to determine content of 1. carbon and 2. photosynthetic pigments chlorophyll *a* and phaeophytin *a*). As water turbidity changes, it may be necessary to reduce the filtrate volume from 1,000 to 500 or even 300 ml to prevent damaging the vacuum pump; this is common with samples from Black Lake. Filtrate volumes will be logged on the sample petri dish's label. Multiple filter towers may be used if the equipment is available. Using sterile forceps, a sterile glass microfibre filter will be placed on the filter apparatus. One hundred ml of deionized water will be used to rinse the tower and moisten the filter. The rinse water will be discarded from the flask after being drawn through the filter. A portion of sample water will be poured from the graduated cylinder(s) into the filter tower(s). The vacuum pump should be run at approximately 15 psi; increased sample water turbidity may require increasing the pump's draw to 20 psi. As the sample passes through the filter, more of the sample water will be added from the graduated cylinder until all 1,000 ml are filtered. As the last 50 ml of the chlorophyll-*a* sample is filtered, 5 ml of $MgCO_3$ solution will be added to the tower. The pump will be turned off when all towers are empty. The particulate nutrient filters will be removed with forceps from the filter apparatus, placed in appropriately labeled petri dishes, and frozen until shipment to the ADF&G Near Island Limnology lab for final processing.
5) Filtered frozen water nutrient content: This filtration will occur during the carbon particulate processing. A small portion of sample water will be filtered through the apparatus and discarded to rinse the filtration flask. Then approximately 450 ml of filtrate will be retained from the filtrate flask and placed in a rinsed (with filtrate) 500-ml bottle. The bottle will be appropriately labeled, sealed with electrical tape, and frozen.

Processed samples with ice packs will be shipped to the ADF&G Near Island Limnology Laboratory in a sealed cooler after the frozen samples have hardened. The samples will be shipped via ADF&G pilots or commercial air carrier. Zooplankton and phytoplankton samples will be placed in a separate non-frozen transport box lined with a plastic bag and shipped. Before shipping, lab personnel (486-1920 or 486-1817) and the project biologist (486-1805) will be contacted to inform them of arrival time. Original DLS forms (Figure 12) will be shipped to the Near Island Limnology Laboratory and a copy will be retained at Chignik.

Beach Seining

Black Lake

To assess habitat use by juvenile sockeye salmon and collect AWL data, four sites will be beach seined monthly (May-July) in Black Lake (Figure 10; Appendix E1). A 3 mm mesh, 10 m long, 1 m deep seine will be used. A single haul will be made at each location. Each end of the net will be retrieved simultaneously and the lead line will remain in contact with the bottom. Care will be taken to set the gear in a similar manner at all sites and for all sampling events at the same site. All fish species caught will be identified (Appendix B1) and counted. If captured, a total of 45 juvenile (fry and smolt) sockeye, 20 coho *O. kisutch*, and 20 Chinook *O. tshawytscha* salmon will be randomly sampled from the catch and measured for fork length (FL) to the nearest millimeter (mm). The first 25 juvenile sockeye salmon per set will be retained for AWL sampling and stored in a labeled zip lock containing enough MS-222 to induce mortality. The label should include the area, site, method of capture, date, and species. These fish will be transported to the Chignik field lab for AWL sampling. If a specific fish is too small (<45 mm) for scale sampling, it will be assumed to be an age-0 fish. All FL and catch data will be collected and recorded on a *Beach Seine Data Form* (Figure 13); juvenile sockeye salmon AWL data will be entered into the RDA (Appendices C1-5).

Chignik Lagoon

Juveniles rearing in Chignik Lagoon will also be captured monthly by beach seine at four sites (Figure 11; Appendix E1) to assess habitat use, collect AWL data, *and* tissue for genetic stock identification. The first haul will be treated in the same manner as the Black Lake sets to produce a quantified sample. However, in the Lagoon, up to three sets at each location may be conducted to obtain desired sample size of 25 juvenile sockeye salmon. Data from the first set will be recorded on a *Beach Seine Data Form* (Figure 13). If additional sets are made, data will be recorded on a second form and the forms will be numbered 1 of 2 and 2 of 2 per site. Chignik Lagoon juvenile sockeye salmon will be sampled for AWL and genetics tissue within 24 hrs of capture, data will be entered into the RDA (Appendices C1-5; D1). If staff are present, this sampling will occur again in August.

SAFETY

Safety is the highest priority of this project. State safety regulations and Standard Operating Procedures (SOP) will be followed at all times. All staff are personally responsible for assessing unsafe situations and will exercise caution when weighing safety issues. Employees may be subject to disciplinary action without warning, including termination, for noncompliance to state safety regulations.

Employees will be provided the following SOPs and are expected to review them before beginning work:

111-700	Safety Policies and Standards	111-750	Vehicle Safety
111-710	Office/Warehouse Safety	111-760	Laboratory Safety
111-720	Field Camp Safety	111-780	Firearm/Bear Safety
111-730	Aircraft Safety for Passengers		
111-740	Boating Safety		

In addition, all employees are expected to hold a current American Red Cross First Aid/CPR certification. The department will hold First Aid/CPR classes in Kodiak prior to the field season; if the employee is unable to attend the classes in Kodiak, obtaining the proper instruction will be the employee's responsibility.

A U.S. Coast Guard approved personal flotation device will be worn at all times while boating and while working on the smolt traps. Staff should maintain a full spare gas tank in the skiff at all times. A hand-held VHF radio, a flare gun, a tool kit, spare motor parts, and oars will also be in the boat at all times. A satellite phone will be carried when going out of radio range.

REPORTING

The crew leader will compile a daily log. This log will be submitted to the Project Biologist at the end of the field season. The crew leader will contact the project biologist daily at 1300 hours by telephone (486-1805) unless otherwise predetermined. An in-season population worksheet will be completed daily and emailed to the project biologist. The crew leader will record daily smolt emigration counts, water level, water temperature, and trap rpm in the management office after the noon check. The crew leader is also responsible for co-authoring a season summary report, and for completing a comprehensive equipment inventory at the end of the season.

It is desirable for the field crews to photograph all aspects of the fieldwork. Photographs will be taken with a digital camera and downloaded to the research field computer for editing and storage.

TIMESHEETS

The crew leader is responsible for scheduling daily tasks and managing crew hours. Tasks will be scheduled to minimize overtime. Overtime is limited to 30 hours/month (7.5 hours/week) per person, unless otherwise pre-authorized. A proposed work schedule is described in Appendix F1. The crew leader will document, as part of the daily log, all tasks that are performed and the actual hours worked to complete those tasks.

Timesheets will be completed and faxed to Kodiak on the 15th and the last day of each month if possible. If timesheets must be sent in early, amended timesheets can be sent to the Kodiak office if the hours actually worked differ from the hours submitted on the original timesheet. Explicit directions for completing timesheets are located in Appendix G1 and G2.

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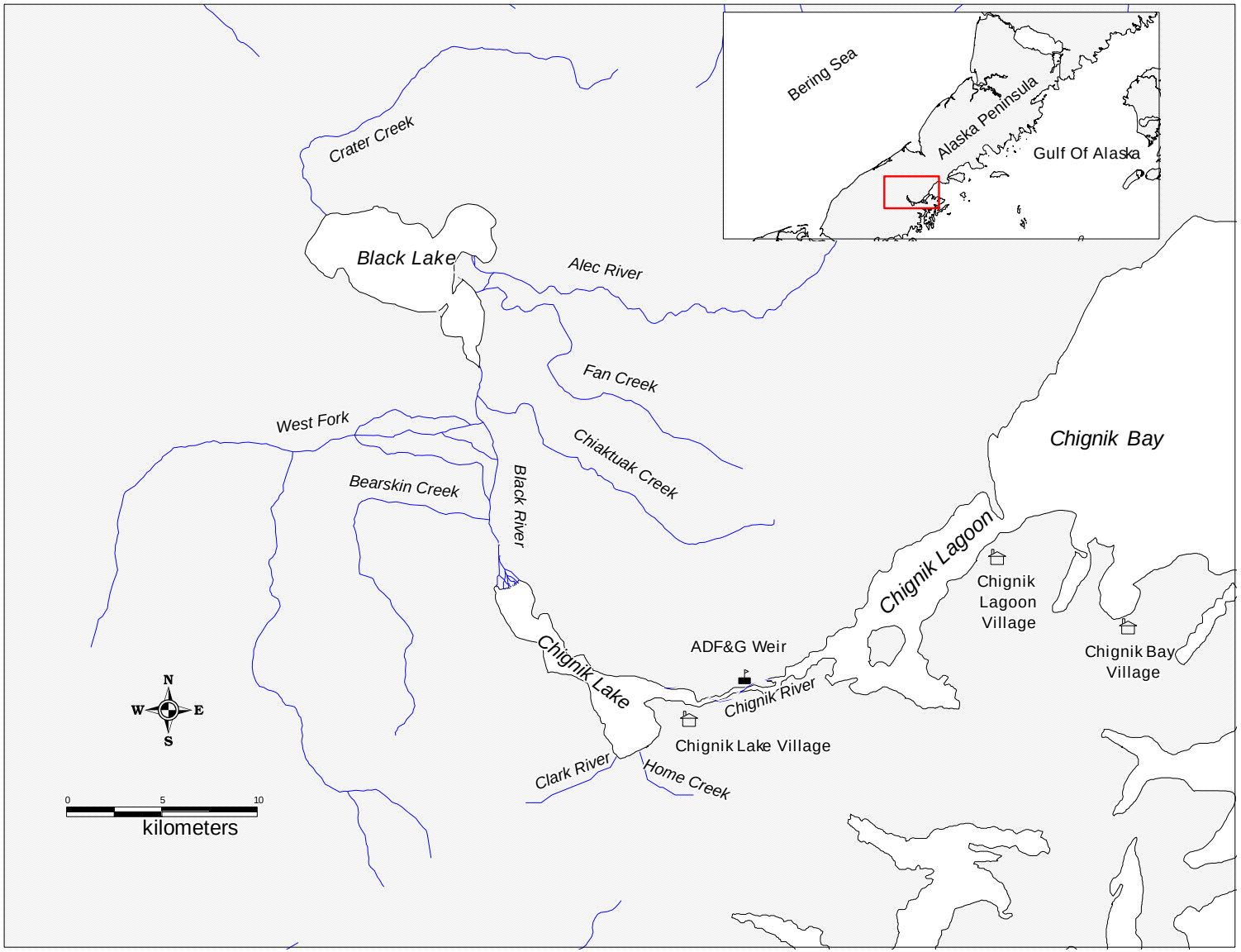

Figure 1.–Map of the Chignik River system.

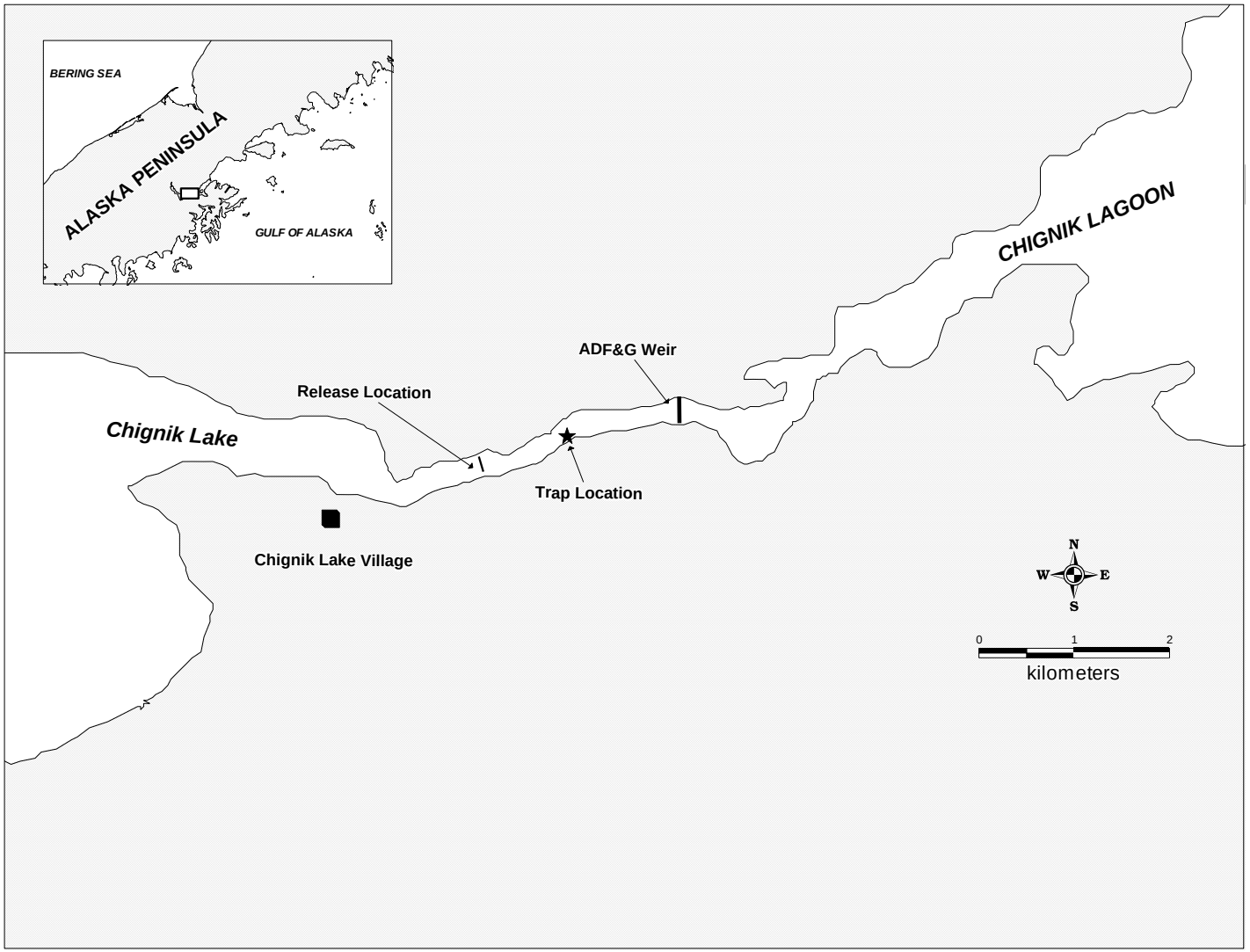

Figure 2.–Location of the traps and release site of marked fish on the Chignik River, Alaska.

Daily Smolt Catch Reporting Form

Trap: _____

Project: Chignik Smolt 2013 Smolt date: _____ Page ____of ____

Time (military)	Sockeye Smolt			Incidental Catch[a]												Comments[3]
	Catch[1]	Trap Mortality	Marked Rec[2]	Sockeye Fry	Coho	Pink	Chnk	Chum	DV	SB	SC	SF	PS	PW	ISO	
Daily Total:																

[1] All catch is to be examined for marks; catch includes all trap mortalities but not marked fish.

[2] Marked Recovery fish may contain mortalities but are only recorded as a marked recovery.

[3] Include trap conditions, counts of species not included in columns (ex. Alaskan blackfish or hooligan), and any other significant information.

[a] DV = Dolly Varden, SB = stickleback, SC = sculpin, SF = starry flounder, PS = pond smelt, PW = pygmy whitefish, and ISO = isopod.

Figure 3.–Daily smolt catch reporting form.

Sockeye Salmon Smolt Reporting Form

Project:_____ Year:_____ Page ____of ____

Smolt Date	Catch (both traps combined)			AWL Sample		Mark-Recapture[2]				Comments
	Daily	Cumulative	Mortalities[1]	Daily	Cumulative	# Released	Daily Recaptures	Cumulative Recaptures	%[3]	

[1] Included in daily count.

[2] Cumulative and % begin over with each release.

[3] Calculated by: % = (cumulative recaptured / #released) * 100

Figure 4.–Sockeye salmon smolt reporting form.

Catch-Weight Worksheet

Smolt Date_____ Page____of ____

Time	Weight	Number of Fish[a]					
		Sockeye	Sockeye Fry	DV	Stick	Coho	Sockeye Recaps[b]
	Total:						

[a] Number of fish in reference sample is from actual counts. Number of fish in subsequent samples is calculated by: $S_c = (S_r * W_s) / W_r$

Where: S_c = Calculated number of fish of each species.

S_r = Number of fish of each species in the reference sample.

W_s = Weight of subsequent sample.

W_r = Weight of reference sample.

[b] Recapture numbers are <u>not</u> included in the number of sockeye column.

Figure 5.–Catch-weight worksheet.

Smolt Dye Release Form

Smolt Day:_____ Grams Dye:_____
Tote Volume:_____

	Time (military)	H_2O Temp.	Comments
Fish into Container			
Begin recovery water exchange			
Addition of dye			
Begin water exchange			
Begin transport			
Release			

Number into container:_____

Number non-dyed held for mark retention experiments:_____

Number dyed held for mark retention experiments:_____

Number mortalities removed:_____

Final number dyed released:_____

Comments (include comments on fish vigor, areas of mortality, how well marked the fish were, etc.):

Personnel:

Figure 6.–Smolt dye release form.

Delayed Mortality/Mark-Retention Form

Date/time fish were marked:_____ Grams dye:_____

Water temp. when fish were marked:_____ Water volume:_____

No. marked fish retained:_____ No. unmarked fish retained:_____

Delayed Mortality

Date	Time	H_2O Temp.	# of mortalities	
			Marked	Unmarked
		Total:		

Mark-Retention

Date	Time	Observer	# Correctly Identified	
			Marked	Unmarked

Comments:

Figure 7.–Delayed mortality/mark retention form.

Daily Physical Data Observation Form

PROJECT Chignik Smolt

YEAR 2013 LOCATION Smolt Traps

DATE[a]	TIME	TEMPERATURE (C)		CLOUD[b]	WIND[b]		Trap RPM		GAUGE	COMMENTS (i.e., rain, drizzle, etc...)
		Air	Water	COVER (%)	DIRECTION	VEL (kts)	Small	Large	HEIGHT (cm)	

[a] Actual calendar dates.

[b] Based on observer estimates.

Figure 8.–Daily physical condition observation form.

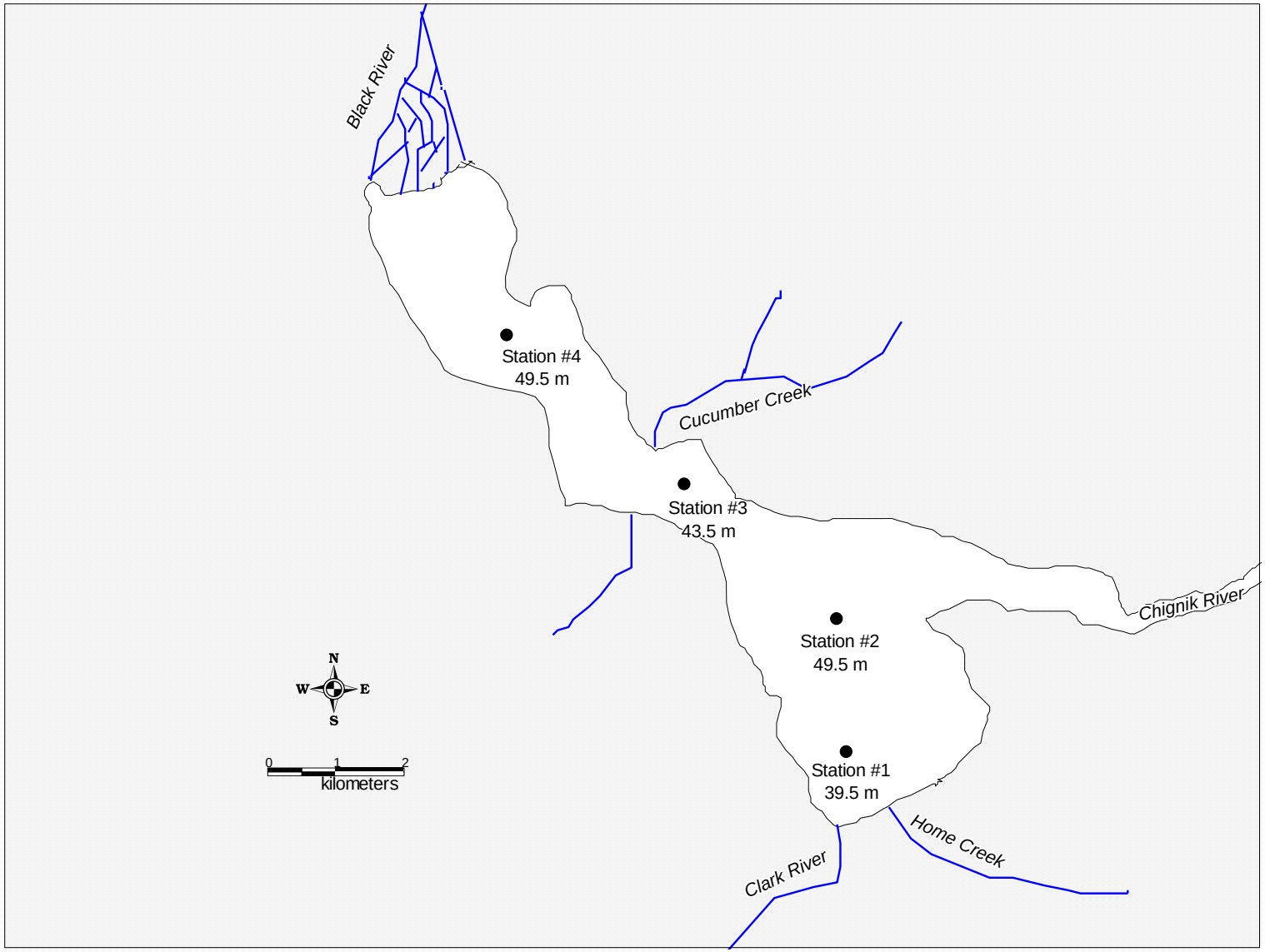

Figure 9.–Locations of the Chignik Lake limnology sampling stations.

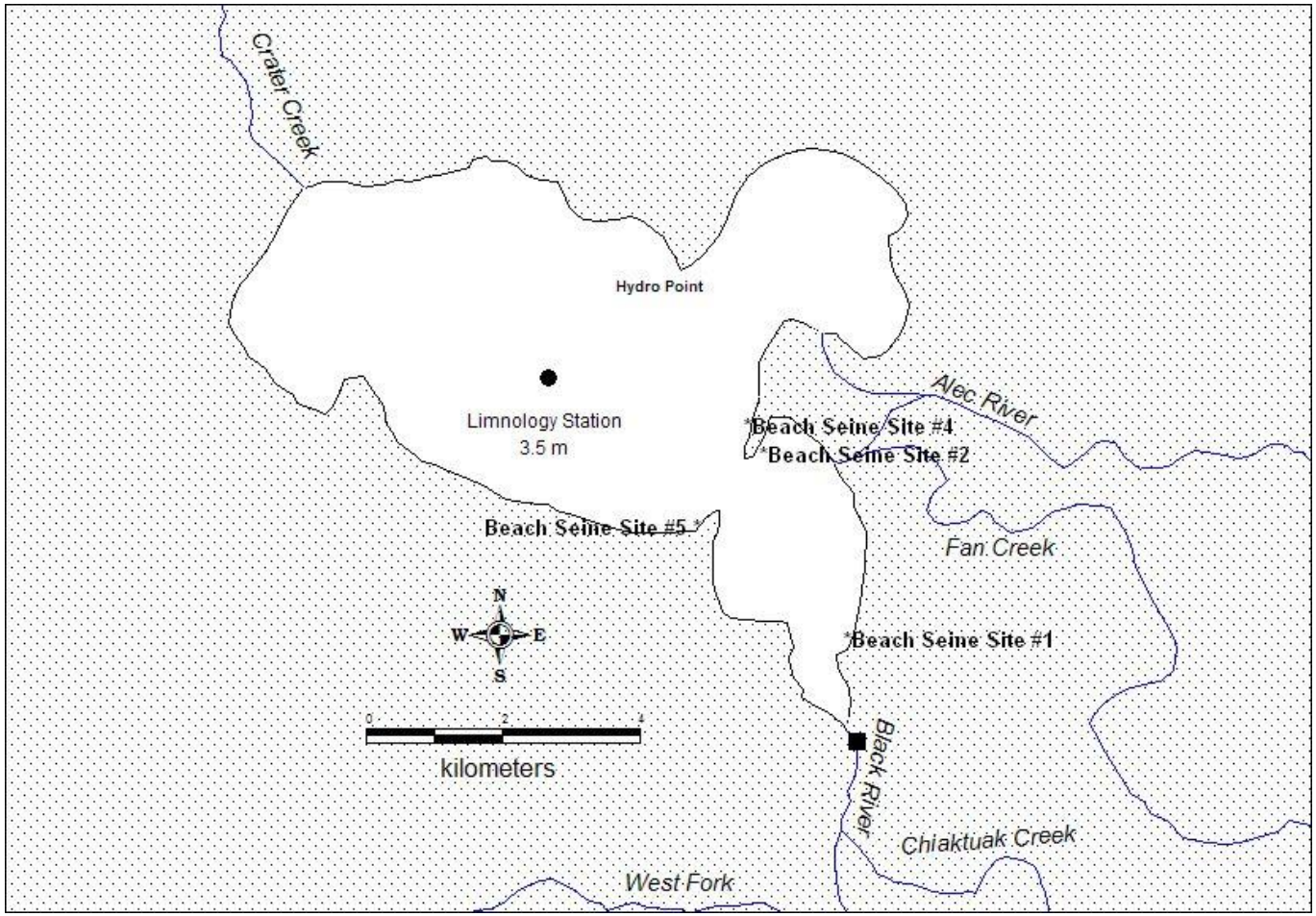

Figure 10.–Location of the Black Lake limnology sampling station and the approximate beach seine sites.

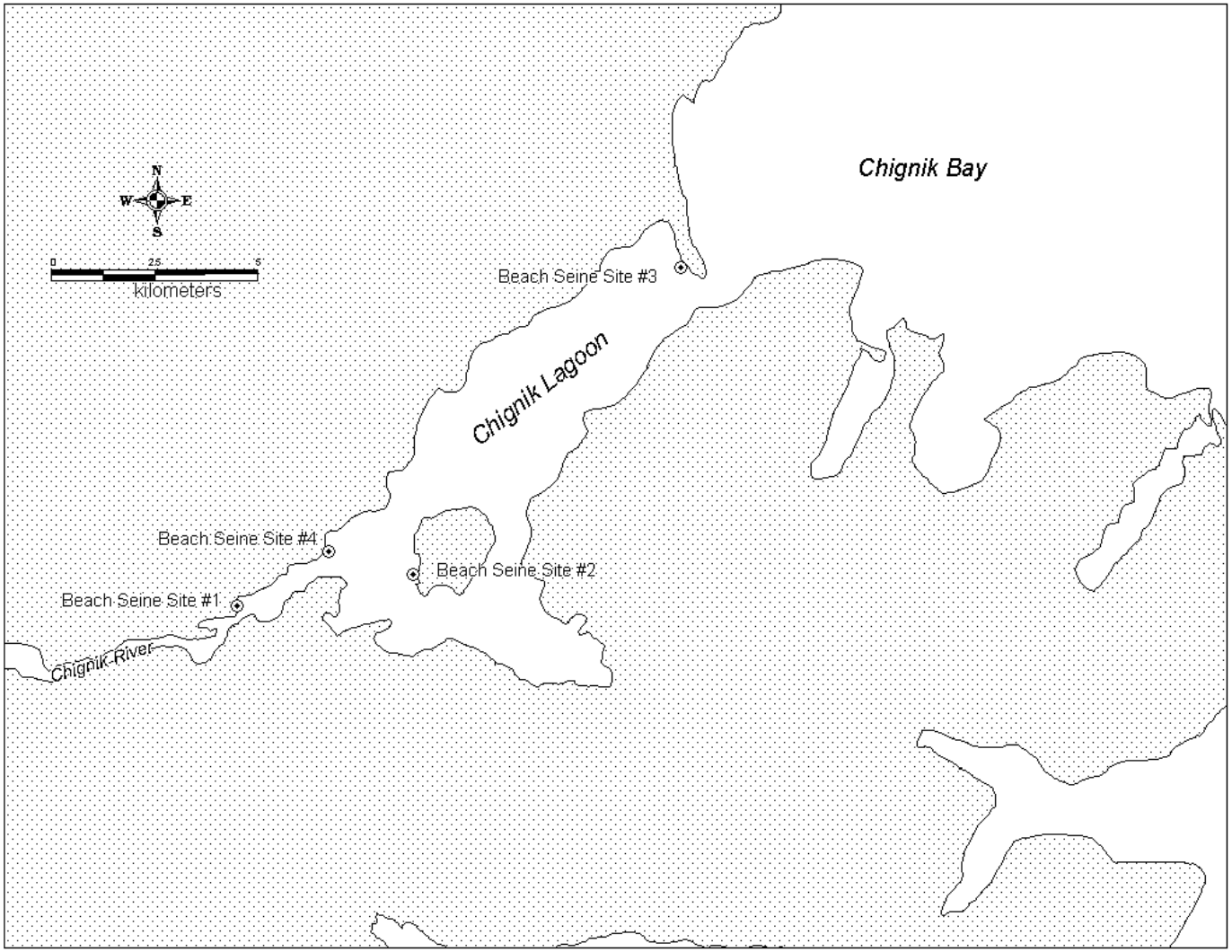

Figure 11.–Map of Chignik Lagoon showing the approximate locations of the beach seine sites.

Detailed Lake Survey Field Form - Division of Commercial Fisheries, Limnology Section

Lake Station Bottom depth (m)

Weather and lake surface conditions

Date Name (s) of sampling personnel Time

Physical Parameters

Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/l)	Depth (m)	Solar Illuminance (PAR - micromoles) Sensor Up
Incidence			Incidence	
Surface			Surface	
0.5			0.5	
1.0			1.0	
1.5			1.5	
2.0			2.0	
2.5			2.5	
3.0			3.0	
3.5			3.5	
4.0			4.0	
4.5			4.5	
5.0			5.0	
6.0			6.0	
7.0			7.0	
8.0			8.0	
9.0			9.0	
10.0			10.0	
11.0			11.0	
12.0			12.0	
13.0			13.0	
14.0			14.0	
15.0			15.0	
16.0			16.0	
17.0			17.0	
18.0			18.0	
19.0			19.0	
20.0			20.0	
21.0			21.0	
22.0			22.0	
23.0			23.0	
24.0			24.0	
25.0			25.0	
30.0			26.0	
35.0			27.0	
40.0			28.0	
45.0			29.0	
50.0			30.0	

Hand Held Temp. Water: Air:

Comments:

Water samples:

Samples were / were not collected

Depths of samples collected:

1m		29m	
5m		30m	
10m		35m	
15m		40m	
20m		45m	
25m		50m	

Zooplankton:

Zooplankton tow depth: (m)

Secchi disk:

Disappeared: (m)

Reappeared: (m)

Mean disk reading: (m)

pH & Alkalinity:

1 m	pH:		
titration	end:		
volume (mL), start:			
	difference:	*10 =	Alkalinity
29 m	pH:		
titration	end:		
volume (mL), start:			
	difference:	*10 =	Alkalinity

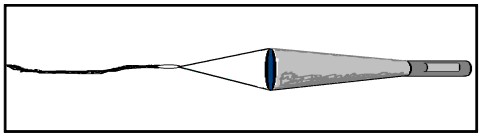

Figure 12.–Detailed Lake Survey form.

Chignik Smolt Beach Seine Data Form

Pg__of__

The first 25 juvenile sockeye salmon randomly selected will be collected per station for AWL (& Chignik Lagoon genetics) and enter into the RDA. If available, record an additional 20 SOX smolt fork lengths (FL).

#	Additional SOX Smolt FL (mm)	Chinook FL (mm)	Coho FL (mm)	Other: FL (mm)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Comments:

Date: _____

Location: _____

Site #: _____

Personnel: _____

Time of Set: _____

Air Temp (°C): _____

Water Temp (°C) _____

Weather: _____

_____

Total Catch	
Sockeye smolt	_____
Sockeye fry	_____
Chinook	_____
Coho	_____
Coho fry	_____
Pink	_____
Dolly	_____
Sculpin	_____
Pond Smelt	_____
Stickleback	_____
Flounder	_____
Other	_____

Figure 13.–Beach seine data form.

APPENDIX A. SMOLT TRAP CONSTRUCTION, PLACEMENT, AND DISASSEMBLY

The procedures for setting up the Chignik smolt traps are divided into two distinct components, trap installation and weatherport placement. The first priority upon arrival to Chignik is the assembly and installation of the traps. The assembly and installation of the weatherport storage station is of secondary importance: it can be constructed after the traps are installed and monitoring has been initiated.

SCREW TRAP ASSEMBLY

Three rotary screw traps were stored near the lake outlet at the Fisheries Research Institute camp at the end of the field season. There are two small traps of equal size and one large trap. The two small traps can be easily differentiated. One small trap has a live box with an extended holding compartment and no skimming wheel. The other small trap has a skimming wheel and has been modified to be used as a live box. This apparatus has an aluminum plate bolted to the cone entrance. Each trap consists of a rotary screw, two pontoons, a dual beamed live box, a front spindle support beam with associated plastic bushing, a front structural beam, and a bipod hoisting structure. Each trap and its component parts are stacked together. All hardware including winches, pulleys, pulley harnesses, and bolts are appropriately labeled and located in a large tote in the smolt cave.

The following photographs (Figures 1-7) illustrate the smolt trap components and some of their features.

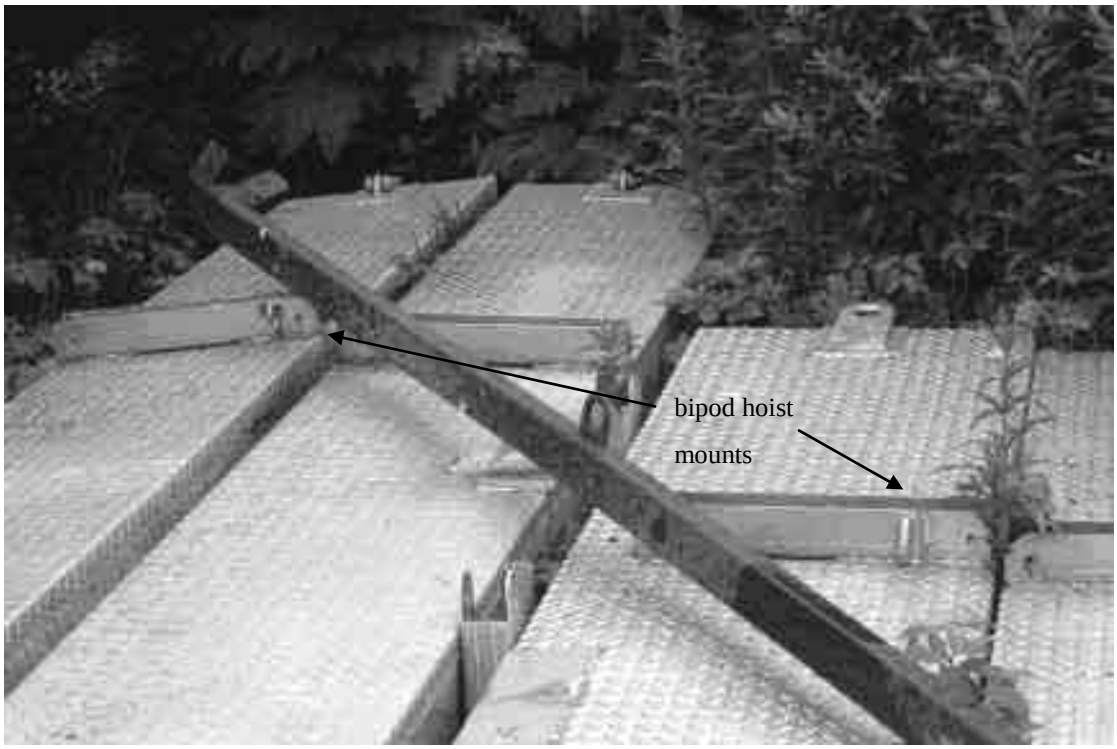

Figure 1. The photo shows the bow end of two sets of trap pontoons and a single front structural beam. The front beam sleeves, harness eyes, and bipod hoist mounts are also visible from this angle.

-continued-

Figure 2. The photo illustrates the dual beamed live box for the large trap. The winch mount on the starboard pontoon is also visible from this angle.

Figure 3. The photo illustrates how the pintle ring fits over a stern beam sleeve. This photo does not show the live box beams inside the sleeve.

-continued-

Figure 4. The photo illustrates the large rotary screw drum.

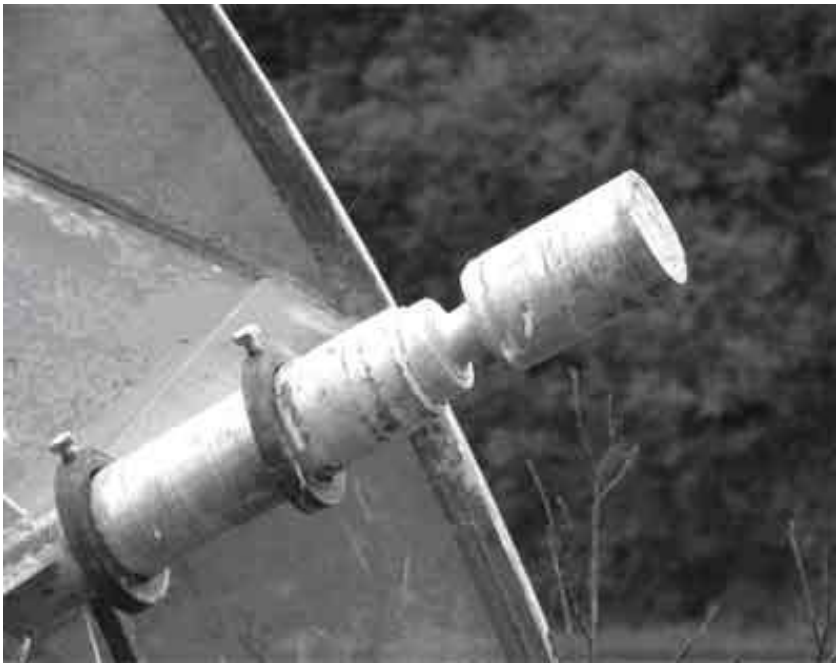

Figure 5. The photo illustrates the large trap cone spindle and O-rings. Excessive wear on the spindle can occur due to improper placement of the bipod hoist structure. Care should be taken so that the bipod hoist structure does not contact the rotating spindle. The small trap cone has a sleeve attachment.

-continued-

Figure 6. The picture shows the entrance to the live box and the rear spindle mount and plastic bushing. Check for excessive bushing-wear frequently throughout the season and report to project manager.

Figure 7. This photo illustrates the bipod hoist structure with the sliding plastic spindle bushing. Check for excessive bushing-wear frequently throughout the season and report to project manager.

-continued-

The small trap that has been modified for use as a live box will be assembled first. The pontoons will be moved down to the beach placing them in the correct orientation with regards to starboard and port labels at the bow end. A 20-25 foot section of crab line will be tied to the eyes at the bow end of each and then a line will be tied from a large willow on the beach to this loop anchoring the apparatus to the shore.

The dual-beamed live box will be moved down to the beach. The live box will be bolted to the stern end of the pontoons while it is in the water so that the beams fit correctly in the sleeves. In order to accomplish this, the stern end of both pontoons will be pushed out in the river to get enough clearance to attach the live box. The starboard side will be bolted first. This will take at least two people to manipulate the live box and pontoon to align the bolt holes. Have a crow bar, rubber mallet, and needle nose pliers available to aid with the adjustments. The live box will be attached to the port pontoon by sliding a pintle ring sleeve over the front beam and beam sleeve and securing them with bolts long enough to pass through all three components.

The front structural beam will be seated in the beam sleeves and bolted to the starboard pontoon while a pintle ring sleeve will be fastened to the port pontoon. This will complete the assembly of the live box. The large and small screw traps will be constructed in the same fashion except pintle rings will not be attached to the large trap and bipod hoist structures will be bolted to the pontoons behind the front structural beams of both traps. Be sure that the flat A-frame surface is facing the stern end (Figure 12).

The partially constructed traps will be pushed out into the stream so that the live boxes are afloat, and the rotary screw will be rolled down to the edge of the river and positioned with the cone entrance behind the front structure beam. An O-ring will be attached to the rear spindle and the spindle inserted into the live box spindle mount.

The front of the screw spindle will be inserted through the sleeve on the front spindle support beam. Two O-rings will be attached to the front of the spindle to hold it in the sleeve. The small cone sleeves contain predrilled screw wholes for holding the O-rings in place. The winch will be bolted to the winch mount on the starboard pontoon. The pulley system will be attached so that the rotary screw can be raised. The first pulley will be attached to the starboard side of the front beam with a chain link. The second pulley will be affixed to the eye in the middle of the front beam with a chain link. The third and final pulley will be bolted to the peak of the bipod hoist structure. The cable will be then threaded through all three pulleys and attached to the rotary screw support beam with the appropriate fastener. The rotary screw will be raised out of the water and an aluminum I-beam will be placed on the pontoons beneath it to act as a chock for transit to the trapping site. The assembly procedures for the large trap will be the same as the small trap.

-continued-

TRAP PLACEMENT

Once the live box and traps are assembled, it is time to begin towing preparations. Two anchor lines and towing harnesses are located in labeled totes in the smolt cave and are tagged for the appropriate trap. Tie the anchor lines prior to towing. The alders to be used for anchors are marked with flagging. The anchor line labeled for use with the small trap will be tied to the flagged alder that is furthest downstream and the large trap line will be tied to the upstream alder. Use a clove hitch to tie off the line and connect the end to a backup alder. A towing yolk to be connected to the back of the skiff is hanging in the smolt cave.

The small trap and the legs will be transported to the trapping site first. The trap will be carefully worked into shore at the trapping site. The anchor line can be clipped to the pulley harness and the tow line detached. (Figure 8).

Now the trap legs can be attached to the port-side pintle rings (Figures 9 and 10). The leg supports will be placed on the shore as high as possible while still allowing the legs to extend out far enough in the stream. Sand bags are necessary to weigh down the trap legs to prevent shifting from water traffic and weather conditions. Sand bags and rocks will be used as a base for the leg supports. The live box platform can then be attached to the stern of the small trap, anchored to shore, and its legs secured between the shore and its pontoons.

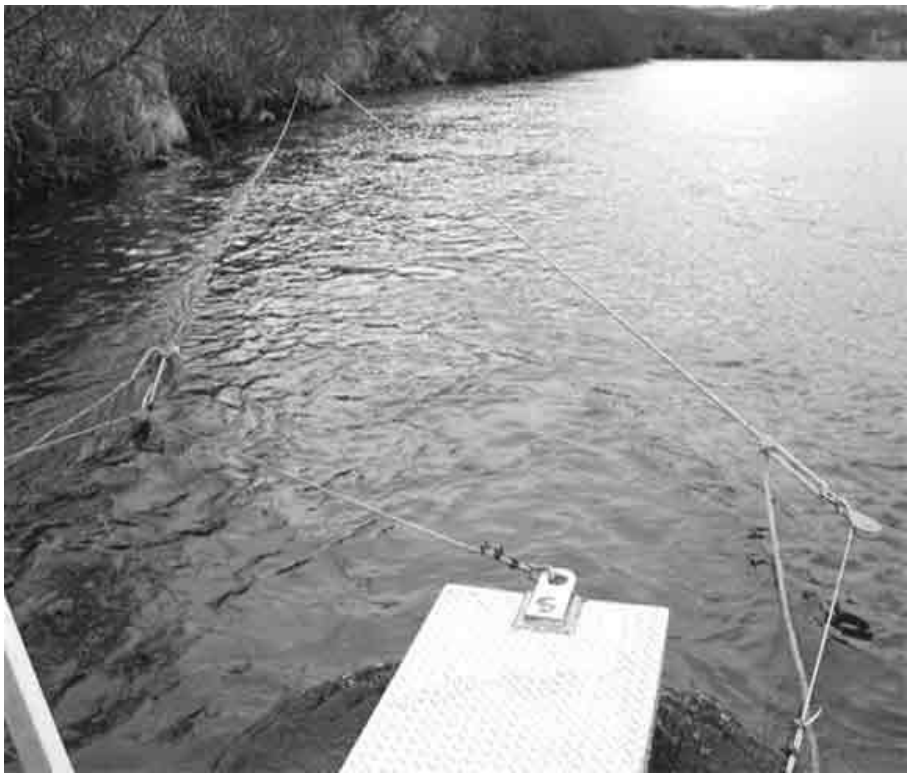

Figure 8. Pulley harnesses attached to anchor lines.

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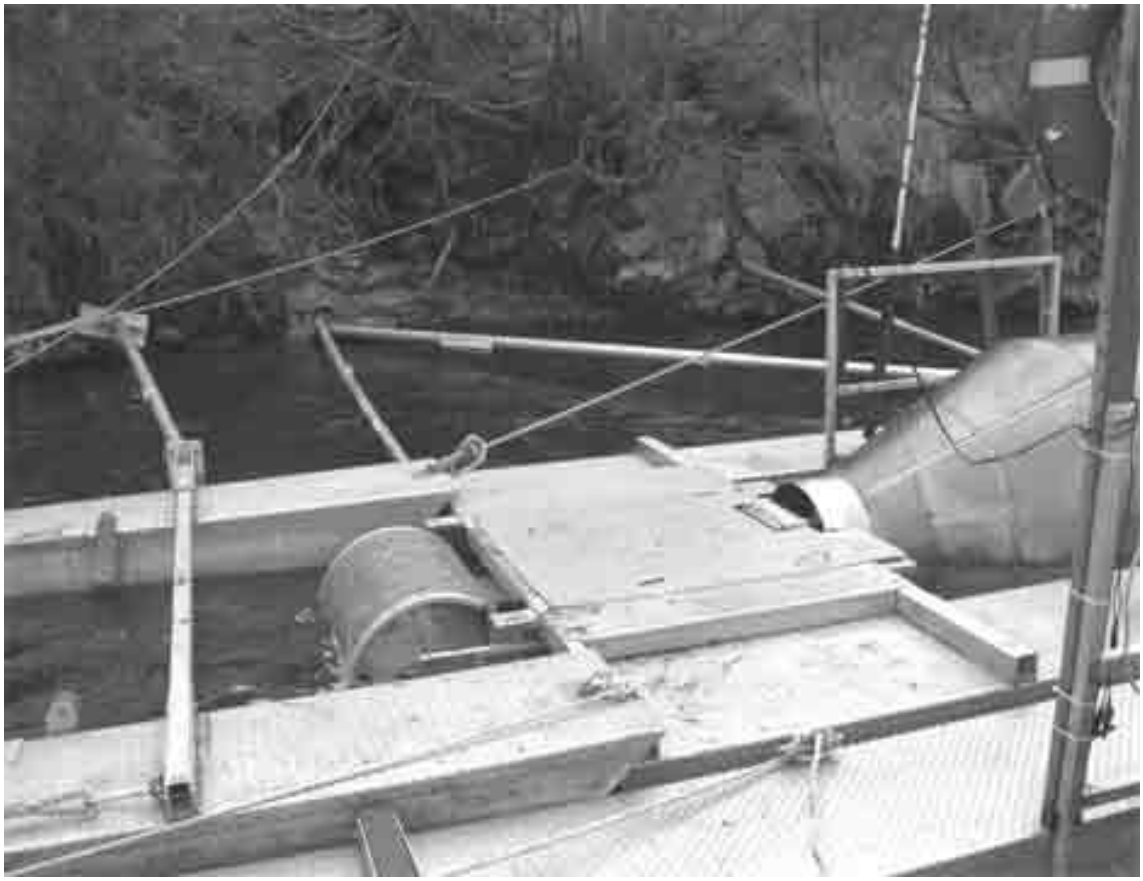

Figure 9. This photo illustrates the position of the trap legs on shore and how the pontoons of the small trap and live box work area align.

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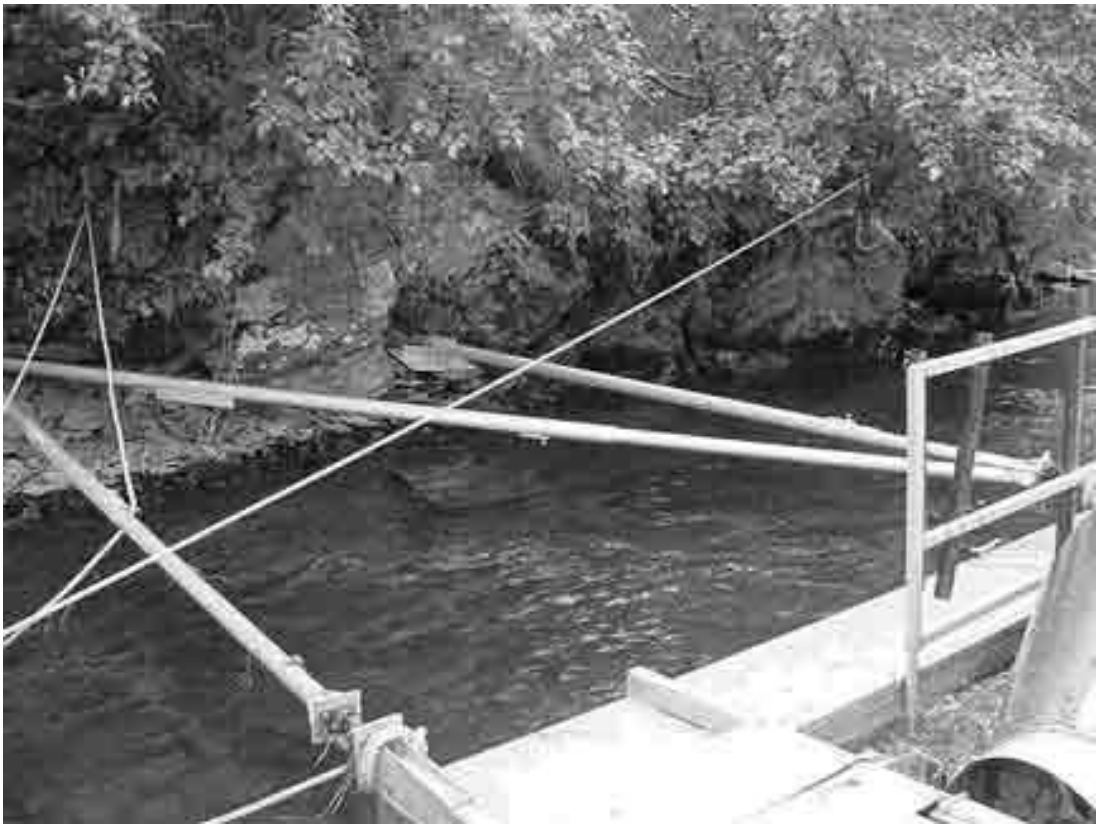

Figure 10. The photo illustrates the trap leg system, anchor lines, and pintle ring sleeves.

After the trap has been pushed out the rotary screw should be lowered and allowed to operate under flow. After testing the trap, some adjustments might be necessary to the trap legs or to the anchor line. Upon completion of setting the small trap and legs, the large trap can be placed. The large trap will be towed below the small trap in order to turn around and tow it back upstream. One person will ride on the trap while the other person will operate the skiff. The trap will be towed upstream so that it slides slowly up against the side of the small trap. The anchor line can then be clipped to the trap harness and the tow line unclipped. It might take some effort to get the anchor line the right length so that when the rotary screw is lowered into the water the entrances into both rotary screws are in parallel alignment (Figures 12 and 15). To tighten the anchor lines, attach crabline to the anchor line using a prusik knot. Pull the prusik from a separate anchor with a come-along. Take up the slack in the main line by adjusting the clove hitches.

-continued-

Figure 11. The assembled large trap fishing. Note that the front spindle support beam is resting on the pontoons. The spindle should be turning with little resistance inside the bushing and minimal play between the O-rings. This prevents excessive wearing of the bushing.

-continued-

Figure 12.Traps fishing. Note the alignment of the cones.

-continued-

FLOATING WEATHERPORT PLATFORM

The floating weatherport platform is composed of the floats and a weatherport platform (Figure 13 and 14). The float frame consists of nine dock floats and three nose cones that remain assembled between field seasons (Figure 13 and 14). The platform is stored on the bulkhead over winter. The weatherport will be assembled on shore at the lower end of the bulkhead so that it can easily be slid into the water upon completion. A section of rope will be threaded through the eyeholes to create a towing harness and anchor line for securing the weather port to shore during construction (Figure 13).

Figure 13. The photo illustrates the platform, pontoon frame, harness/anchor line attachment, and weatherport construction.

-continued-

THE WEATHERPORT

The weatherport tent frame, fabric, door, and poles are located in the smolt cave. All bolts and pole joints are located in a labeled tote in the smolt cave. The weatherport tent frame, fabric, door, and poles are located in the smolt cave. All bolts and pole joints are located in a labeled tote in the smolt cave. The weatherport frame will be arranged and bolted on the platform floor so the door is oriented to the bow end of the floats. A curved tent pole will be inserted onto each post on the frame and connected to the other curved poles with the three way joints. The curved poles which make up the middle hoop will be fitted with the four way joints. After putting the hoops together, the door and rear wall will be attached by hooking the tensioning cord to the cord hooks on the frame. Tighten the cords to make the fabric fit snuggly on the poles and tie them off to cleats on the weatherport frame. The three hoops will now be connected to each other at the joints with the straight poles. The top fabric will be pulled and centered over the tent framework. The top fabric will be tensioned over both walls and down to the frame in the same manner as the walls. It will be necessary for one person to stand in the inside of the tent and feed loose fabric to gain maximum tension on the fabric. Once the weatherport has been set up for a few days and stretched, the fabric and cords will need to be retightened. The flaps at the bottom of the fabric can then be stapled to the platform frame to seal the tent from wind.

Prior to deployment, the weatherport will be loaded with all sampling equipment including dipnets, depth gauge, dye test totes, buckets, weather port tote, shelf, chairs, table, and the kerosene heater. All items should be placed toward the stern end to ensure easier towing. The weatherport will then be clipped to the tow harness with the anchor line and towed upstream to the trap. If possible, towing should occur at high tide to allow for minimal current at Devil's nose. The skiff will be parked and tied off to the large trap. The weather port will then be pulled upstream by hand behind the live box work area and the anchor line can be unclipped from the tow harness and tied off to a cleat on the live box platform (Figures 14-16). A line will be tied to a cleat on the starboard side of the small trap and first fed through the eye on the starboard-side of the weatherport platform. The same line will be fed through the middle and port eyes on the weather port platform and anchored to shore (Figure 16). Additionally, a safety line will be tied from the port pontoon nose cone to an upstream alder.

-continued-

Figure 14. Position and attachment of the weatherport behind the live box work area.

-continued-

After the traps are properly oriented, a wooden mast will be attached to the portside handrail on the large trap using zip ties. This will be used to hold a safety floatation ring, to mount a 12-V work light, and to support the catch-weight apparatus. Photosensitive flashing lights will also be mounted on the large trap starboard hand rail to serve as a warning to boat traffic during nighttime hours.

Figure 15. The photo shows the correct orientation of both traps and the weatherport.

-continued-

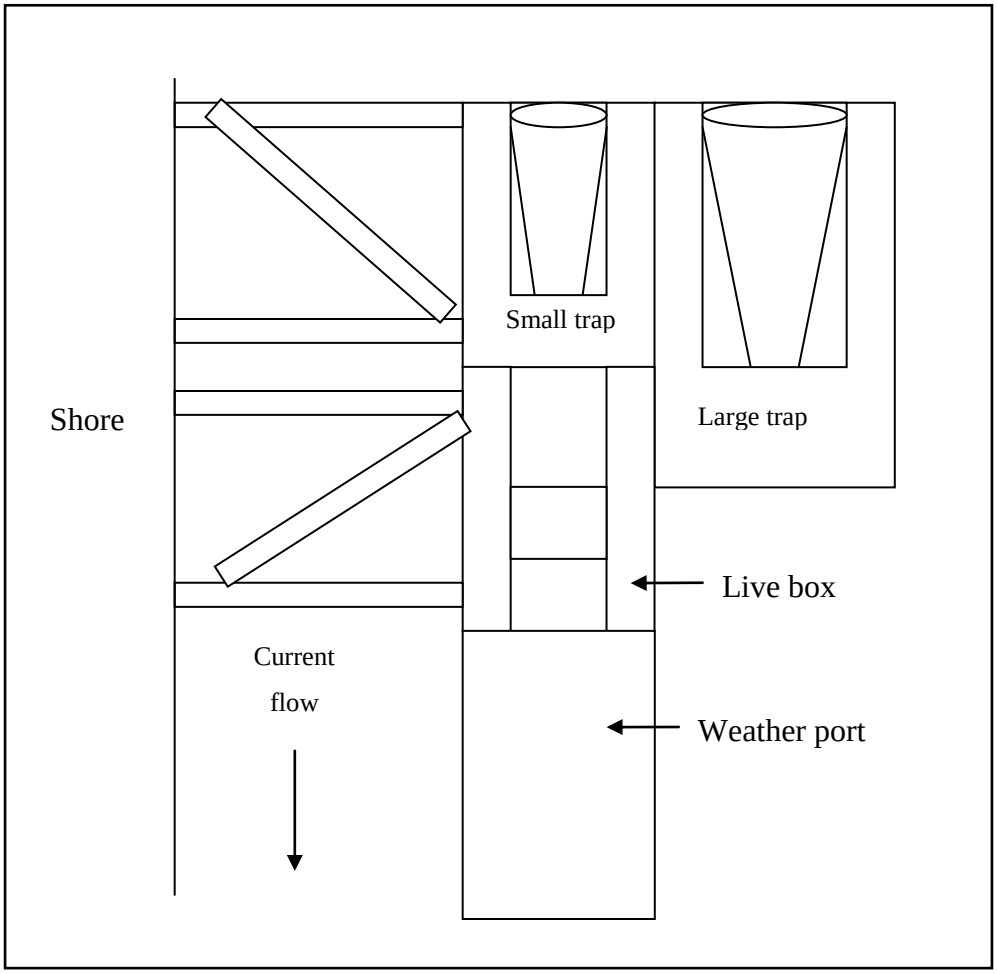

Figure 16. The diagram shows the correct orientation of both traps and the weatherport.

-continued-

TRAP AND WEATHERPORT DISASSEMBLY

1) WEATHERPORT

- Trap disassembly should take approximately 6 hours with 2-3 people.
- Lift both traps out of the water, preferably at end of a smolt day (1200 hrs), and secure with winches.
- Transfer dip nets, strobe light, depth gauge, wooden mast, thermometer, live totes, and live box decking into weatherport.
- Attach weather port anchor line to tow harness on stern of smolt skiff and carefully tow to the weir facility.
- Secure weatherport with anchor lines to shore, upstream of upper dock, for later disassembly.

2) LIVE BOX

- Remove live box legs (3) from pintle rings with 3/4" ratchet. Place legs in the smolt skiff.
- Attach tow harness to bow crossbar of live box. Attach live box tow harness to tow harness on stern of smolt skiff.
- Untie lines securing rear live box to large/small trap assembly. Allow live box to drift safely behind smolt skiff, paying attention to any possible hang ups.
- Transport live box and legs upstream to FRI site and secure to shore in front of winter storage site for later disassembly.

3) LARGE TRAP

- Motor upstream to large trap anchor line and secure skiff to shore. Untie large trap anchor line from alder and attach it to tow harness on smolt skiff w/approx 5-10 m of line for towing.
- One person will be positioned on the large trap. When the skiff operator has the tow line under tension and ready for transport, the person on the large trap will untie the lines securing the large trap to the small trap. The person on the large trap will remain on the trap during transport and skiff operator will take proper precautions to ensure safe towing speeds/conditions.
- Transport large trap upstream to FRI site and secure to shore near rear of live box for later disassembly.

-continued-

4) SMALL TRAP

- Remove small trap legs (3) from pintle rings with 3/4" ratchet. The trap will swing into shore gently and the anchor lines will become slack. Place trap legs in the smolt skiff.
- Procedures for small trap transport mirror large trap transport.

5) TRAP DISASSEMBLY AT FRI SITE

- Tools needed for disassembly include: pry bar, rubber mallet, smolt tool box, 9/16" ratchet/wrench (2 each), 3/4" ratchet/wrench (2 each), 1 medium tote labeled for trap equipment, 1 labeled 1-gallon zip-loc bags per structure (3 total) for hardware, permanent marker, rite-in-the-rain notebook, pencil, and duct tape.
- Inspect all trap equipment during disassembly process for damage and note any parts that need replacement.
- Disassemble each trap individually and store nuts and bolts in pre-labeled zip-loc bags. Pintle rings, winches, pulleys, labeled pulley harnesses, and nuts and bolts will be labeled by trap and stored in a medium tote. The above mentioned equipment will be inspected for wear, dried, and cleaned before winter storage in the smolt cave.
- Trap legs, pontoons, rotary screw drums, trap hand rails, bipod hoists, front spindle support beams, structural beams, and live boxes will be neatly stored at the FRI site.

6) WEATHERPORT DISASSEMBLY

- Weatherport disassembly should occur the day after trap disassembly and take approximately 3-4 hours.
- Disassembly of weatherport will take place on shore above the upper dock at ADF&G weir site.
- Inspect all weatherport equipment during disassembly process for damage, separate, and note any parts that need replacement.
- The weatherport tent frame, fabric, door, and poles will be disassembled and removed from the platform. Each will be individually cleaned, dried, folded, duct taped, and labeled before storage in the smolt cave. Bolts securing tent frame will be stored in a labeled 1-gallon zip-loc bag.
- The weatherport platform will be left intact and secured to shore upstream of the bulkhead. The platform deck should be weatherized with polyurethane before winter storage if needed.
- The DIDSON crew will store the weatherport platform on the bulkhead at the end of the season.

-continued-

7) STORAGE

- It is recommended that all trap and weather port equipment be stored in the smolt cave over the winter. All tools will be cleaned, dried, sprayed with corrosion resistant spray, and stored in the smolt cave as well. Be sure all tools are accounted for.
- At the end of the season the smolt skiff will be prepped for winter storage on the bulkhead. The smolt skiff will be cleaned, gas tanks removed, toolbox removed, hand bilge removed, and all related gear stored in the smolt cave. The motor will be removed, gasoline drained, oil filled, and positioned on a dolly in the dive shop in an easily accessible spot for retrieval at the beginning of next season.

APPENDIX B. JUVENILE SALMON IDENTIFICATION

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish [1] that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alternative characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics —and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

[1] Especially adult smelt, family Osmeridae.

KEY

1. (47) Adipose fin and scales present. (Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

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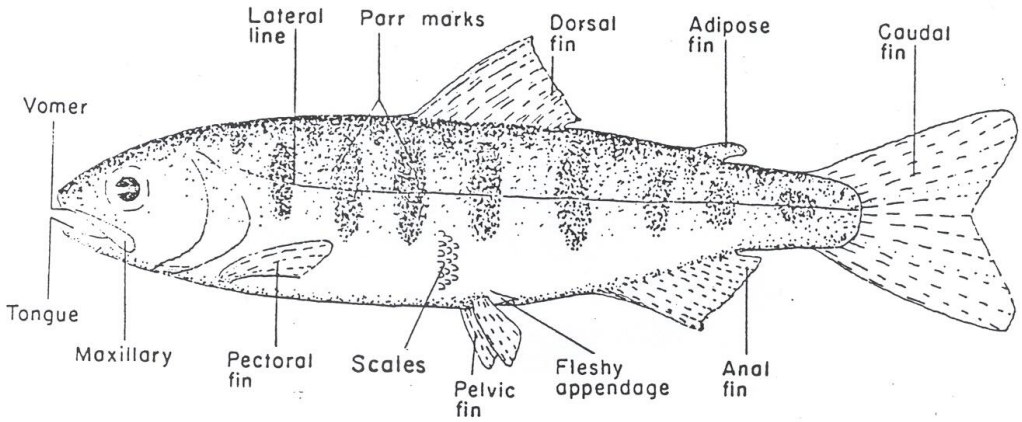

Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

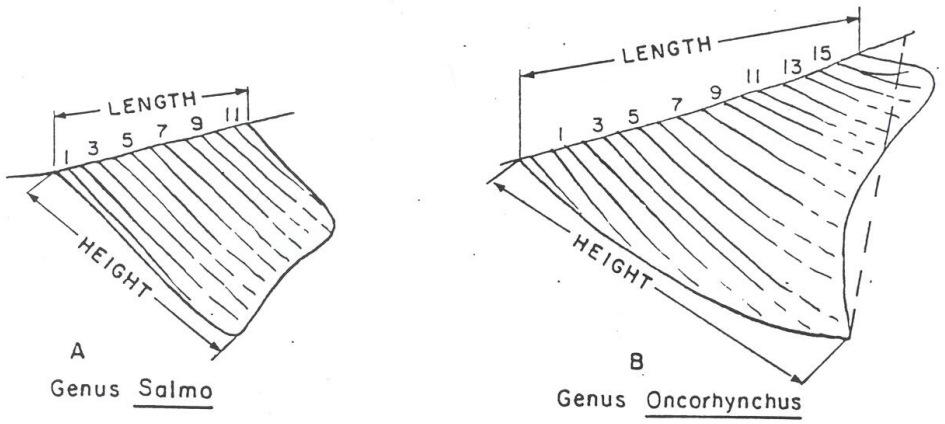

Figure 2.—Anal fins: (A) Trout, genus *Salmo;* (B) Pacific salmon, genus *Oncorhynchus.* The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

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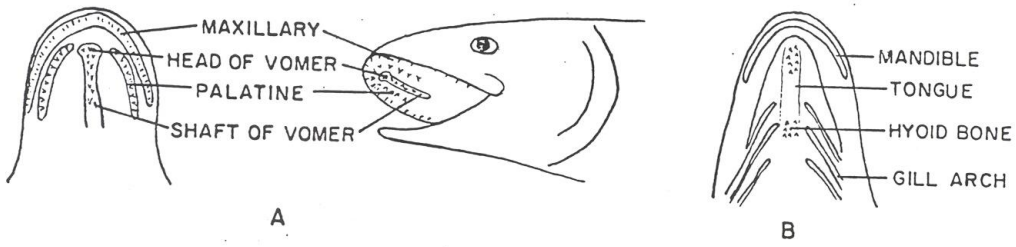
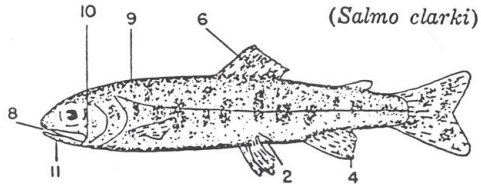


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

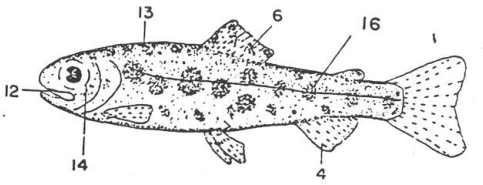
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



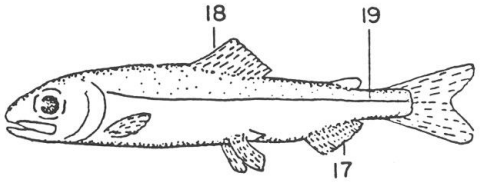
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

16. (20) Parr marks almost round.
Rainbow or
steelhead trout
(*Salmo gairdneri*)



17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



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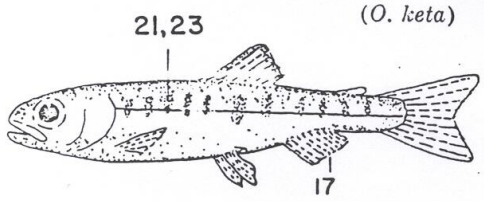
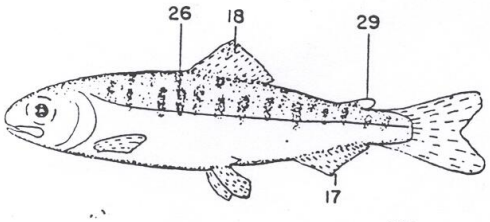
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



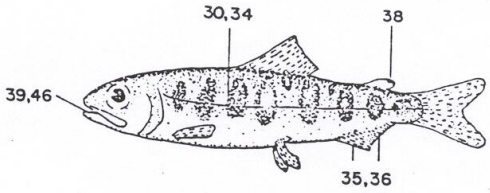
25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



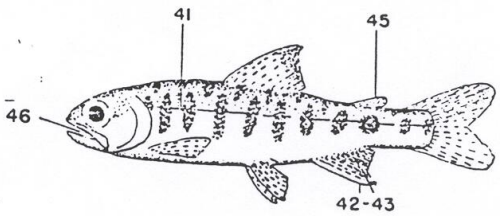
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Pyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Pyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



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47. (1) Adipose fin not present; scales present or lacking.
Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.
Smelts
Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.
50. (51) Depressed dorsal fin, shorter than head.
Whitefishes
Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.
Arctic grayling
(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.
Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.
Brown trout
(*Salmo trutta*)

ACKNOWLEDGMENTS

We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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Figure 1. Juvenile sockeye salmon.

Figure 2. Juvenile coho salmon (smolt and fry use adipose fin as reference to distinguish coho from king salmon).

-continued-

Figure 3. Juvenile king salmon

Figure 4. Juvenile pink salmon.

-continued-

Figure 5. Dolly Varden.

Figure 6. Pygmy whitefish.

-continued-

Figure 7. Coast range sculpin.

Figure 8. Pond smelt.

-continued-

Figure 9. Stickleback.

APPENDIX C. SMOLT SAMPLING

Appendix C1.–Statistical (sampling) weeks and associated calendar dates.

Week	Calendar Dates	Week	Calendar Dates
10	1-Mar – 7-Mar	28	5-Jul – 11-Jul
11	8-Mar – 14-Mar	29	12-Jul – 18-Jul
12	15-Mar – 21-Mar	30	19-Jul – 25-Jul
13	22-Mar – 28-Mar	31	26-Jul – 1-Aug
14	29-Mar – 4-Apr	32	2-Aug – 8-Aug
15	5-Apr – 11-Apr	33	9-Aug – 15-Aug
16	12-Apr – 18-Apr	34	16-Aug – 22-Aug
17	19-Apr – 25-Apr	35	23-Aug – 29-Aug
18	26-Apr – 2-May	36	30-Aug – 5-Sep
19	3-May – 9-May	37	6-Sep – 12-Sep
20	10-May – 16-May	38	13-Sep – 19-Sep
21	17-May – 23-May	39	20-Sep – 26-Sep
22	24-May – 30-May	40	27-Sep – 3-Oct
23	31-May – 6-Jun	41	4-Oct – 10-Oct
24	7-Jun – 13-Jun	42	11-Oct – 17-Oct
25	14-Jun – 20-Jun	43	18-Oct – 24-Oct
26	21-Jun – 27-Jun	44	25-Oct – 31-Oct
27	28-Jun – 4-Jul	45	1-Nov – 7-Nov

SAMPLING PROCEDURES

LABEL SLIDES

The left portion of each slide should be labeled prior to sampling using a fine point permanent marker with the slide number, species, area sampled, date, and fish numbers of the sample (Figure 1).

Slide number

Write the number of the slide.

Species

Write out completely (e.g., Sockeye).

Area sampled

Write the area where the fish were collected.

Sampling date

The sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

Fish numbers

Fish should be sequentially numbered, beginning with 1 each sampling event. By starting with 1 each sampling event, it is possible to track how many fish have been sampled. Five fish are placed on each slide.

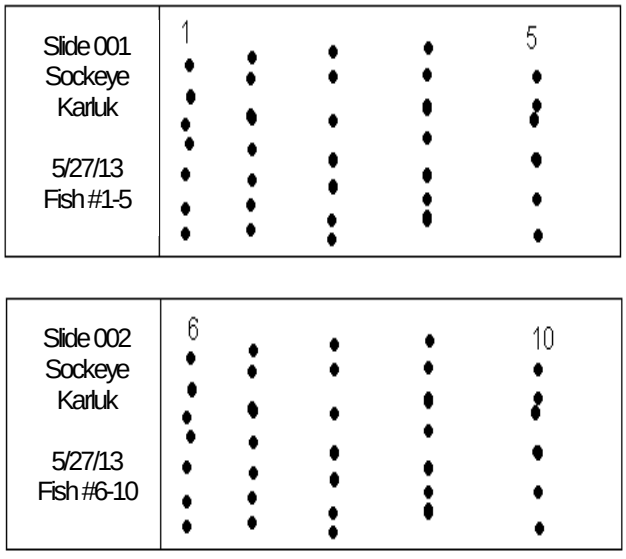

Figure 1.–Properly labeled smolt slide.

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SAMPLE ASAP

Sample smolt as soon as possible after they are captured.

MIX ANESTHETIZING SOLUTION

Wearing latex gloves to prevent direct exposure to the anesthetic, dissolve a small amount (approximately of 1 g) of Tricane Methanesulfate (MS-222) and baking soda in about 2 L of cold water in a dish pan. The amount of anesthetic needed will vary depending on the water temperature, freshness of the chemical, and size of the smolt.

SET UP RECOVERY BUCKET

Set up an additional bucket of water to be used as a recovery bucket. This bucket should be filled with fresh water, aerated, and covered to avoid stress on the fish.

TRANSPORT SMOLT TO SAMPLING AREA

Transport smolt, using clean 5-gallon buckets, to the sampling area. Buckets containing smolt should be filled with fresh water, aerated, and covered to avoid stress on the fish. Fish can be placed into the bucket using a dip net, or by dipping the bucket into the live box.

ANESTHETIZE SMOLT A FEW AT A TIME

Place a few smolt in the anesthetic solution until they become subdued to a point where they can no longer flex their axial musculature but can still ventilate their gills. The concentration of the solution should be such that it immobilizes the fish in 2–3 minutes.

LIGHTLY DRY PREFERRED AREA

After the fish are anesthetized, carefully remove a fish from the dish pan and gently pat dry with a paper towel.

SAMPLE SMOLT

Place the fish on its right side to sample the left side. Quickly and carefully take length and weight measurements, and remove 5–10 scales from the preferred area of the smolt using a scalpel (Figure 2). On salmon species, the preferred scale is located where a straight line between the posterior insertion of the dorsal fin and the anterior insertion of the anal fin crosses the second scale row dorsal to the lateral line. If scales are not present in this area then scales should be taken from the secondary location, which is the same area on the right side of the fish.

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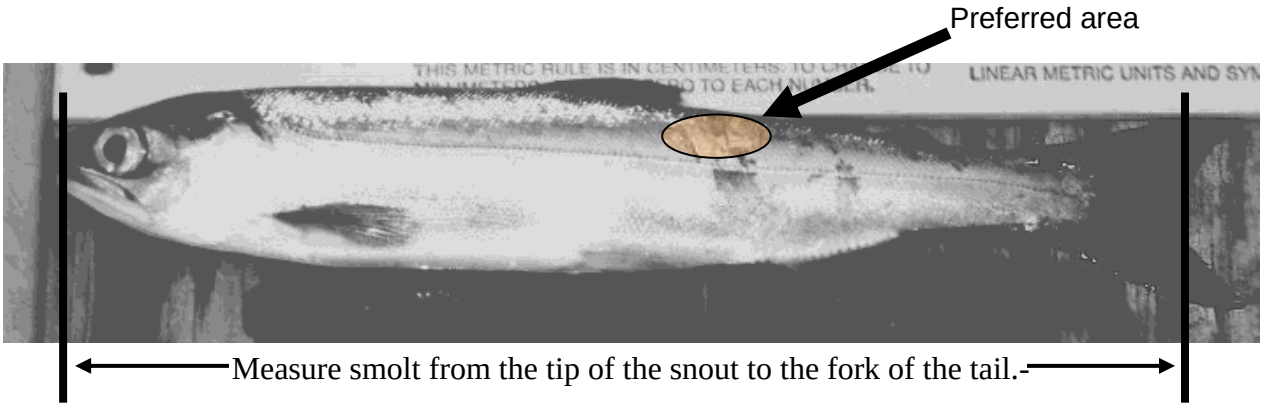


Figure 2.–Smolt with proper length measurement and preferred area highlighted.

MOVE SMOLT TO RECOVERY BUCKET

Transfer sampled smolt from the sampling station to the recovery bucket. It is important to sample as quickly as possible and immediately place smolt into the recovery bucket to prevent mortality.

ALIGN SCALES ON SLIDE

Using the dissecting probe, line up and spread out the scales on the slide under the correct fish number (Figure 1).

CLEAN SAMPLING SUPPLIES

Wipe off the scalpel and dissecting probe to remove scales and slime before another smolt is sampled.

CONTINUE SAMPLING

Continue sampling smolt until sampling goals are met, or all available smolt have been sampled. Depending on how long it takes to complete the sample, the water in all buckets (holding, recovery, and anesthetizing) may need to be refreshed.

RELESASE SMOLT

Once the sampled fish have recovered and are swimming normally in the recovery bucket, they should be released downstream of the trapping location.

-continued-

DATA ENTRY/MANAGEMENT

Data obtained while sampling, is recorded using a Meazura Rugged Digital Assistant (RDA). The RDA is a waterproof device used to digitally record sampling data. Sample information is transferred from the device to a netbook after each sample. A USB flash drive is used to save and transfer data from the netbooks located in field camps, to the office, throughout the season. An RDA is shown in Figure 3.

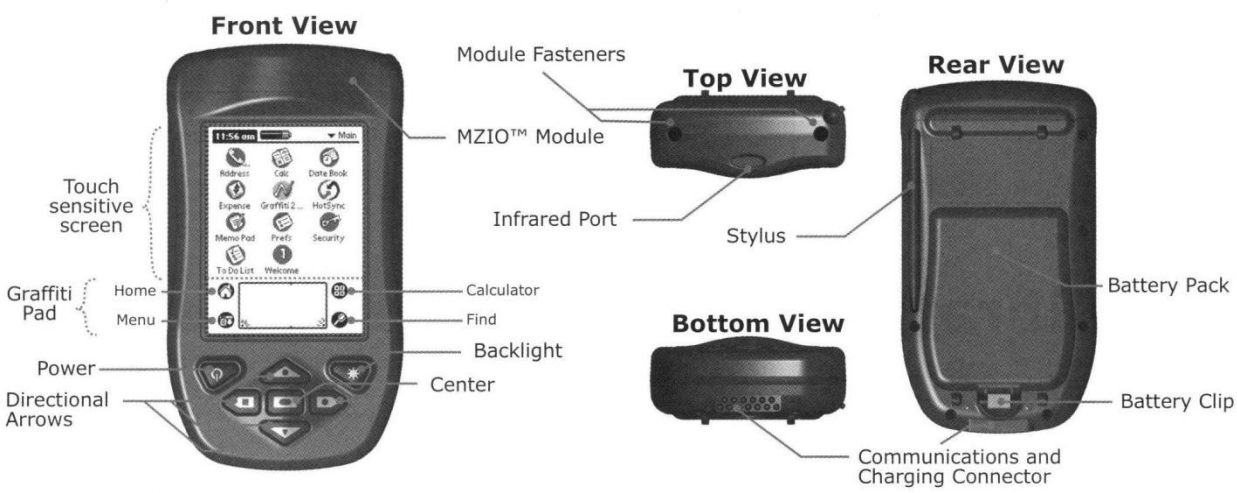


Figure 3.–Rugged Digital Assistant (RDA).

ENTERING DATA INTO THE RDA

To begin using the RDA, turn it on by pressing the power button (Table 1). Using the stylus, tap the home icon in the bottom portion of the screen to bring up the main menu. It may be necessary to press the home icon several times to bring up the entire main menu. Next, tap the Forms 5.1 icon. Pendragon Froms (Forms 5.1) is the program that you will use to enter all of the sample data. After the icon is selected, the Pendragon Forms screen will appear. If a form was left open by a previous user, it may be necessary to hit the Quit or Done button to get to the main list of forms. Highlight the appropriate sampling form (Smolt_2013.XX) and select New, which is found in the lower left corner of the screen. The four main buttons of the form will now be visible: Enter Background Info, Sample Next Fish, Review, and Quit.

-continued-

Table 1.–Buttons and icons addressed in the text.

Image	Description
	Power Button - Button you will press on the RDA itself
	Home Icon - Use the stylus to navigate to the home screens
	Forms 5.1 Icon - Use the stylus to open pendragon forms 5.1
Quit	This is an example of a button within pendragon forms. Use the stylus to select these buttons.

ENTER BACKGROUND INFO

Background information must be entered at the start of each sampling event. A new day always constitutes a new sampling event, so it will be necessary to enter new background information typically once per sampling day. It is important to edit background information when any change in sampling information occurs. The following topics constitute sampling information. If information in one of the following categories changes, it is necessary to change the background information.

Species

Select the appropriate species from the drop down list on the RDA.

Management Area

Choose the relevant management area from the dropdown list. Samples collected from Kodiak Island statistical areas must have Kodiak selected as the proper management area.

Area Sampled

Select the area that best represents where the fish were sampled, such as Ayakulik River, from the dropdown list.

Location ID (N/A for some areas)

Enter the site where the fish being sampled are from. For Karluk Lake sockeye salmon smolt sampling, Site 1 is the outlet site and Site 2 is further downstream.

Location Type

Indicate the type of area in which the fish were captured.

-continued-

Gear Type

Select the type of gear in which the smolt were caught.

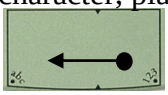
Date of Sample

For smolt, the sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

Sampler Initials

Enter the initials of the sampling crew (up to 3 persons). This can be done by writing in the box on the bottom of the screen, or by using the pop up keyboard.

Notes

1. When entering text, tap on the dot by the abc icon to bring up a keyboard. 
2. To delete a character, place the stylus in the text box and draw a small straight line from right to left. 

SAMPLE NEXT FISH:

After entering background information, the RDA is ready to collect individual fish data. The Sample Next Fish button is used to enter the details of each fish sampled. It is not necessary to click on the Sample Next Fish button when entering the first fish of a new sample. After entering the background information, the form automatically knows to go to the sample next fish section of the form. As you continue to sample, simply tap Sample Next Fish or Next to enter individual fish data. This option is used when continuing to the next fish of a sample where no background information has changed. Fish data that is entered here is associated with the current background information logged. The following constitute fish data and should be entered for each fish.

Scale Slide (Card) Number

Slides are numbered sequentially by date throughout the season starting with 1. A separate numbering sequence will be used for each species or major location change. Consult your crew leader for the current slide number. It is crucial to make sure the number written on the slide matches the slide (card) number entered into the RDA. The slide number will automatically advance to next number after five fish have been sampled.

Fish Number

The fish number is a sequential numbering system that begins with the number 1 for each sampling event. This allows samplers to keep track of the number of fish sampled each day (or since the background was changed). By default, the fish number in the RDA will automatically advance after each fish is sampled.

-continued-

Length in mm

Enter the length of the smolt from tip of snout to tail fork in millimeters (i.e., 108). If for some reason you do not collect a length measurement, enter 999.

Fin Clip and Genetics

Select the Skip Fin Clip and Genetics button if appropriate. If sampling involves fin clips or genetics you can enter the optional fin clip and genetics information.

Sample Next Fish

Select Sample Next Fish to continue sampling.

REVIEW/EDIT

The review button can be a very useful tool during sampling. It can be used to ensure data being entered is accurate, or it can be used for editing fish data during a sample. The review portion of the form displays slide number, fish number, length, and weight. The most recently sampled fish appear first. To enter the review screen, tap on the Review button on the main screen of the form. After the data has been reviewed and edited, tap the Done button on the bottom right of the screen to return to the main screen of the form. If Sample Next Fish is selected after leaving the review screen, the auto-increment will continue as if the review screen was never entered.

Reviewing Data

To review the last data entered, tap the Review button on the main screen of the form. Use the scroll bar on the right side of the screen to look at the fish that have been entered.

Editing Data

If fish data needs to be edited, tap on it using the stylus. Tap on the Sample Next Fish button to go through the fish data that was previously entered for that fish. Changes can be made as needed. Buttons chosen prior to the review are highlighted with asterisks. After a fish has been edited, the main review screen appears. If a fish is accidently selected from the main review screen, click the button that has the slide#-fish# to return to the main review screen without going through the fish data. As mentioned above, tap Done to exit the review portion of the form and return to the main screen.

QUIT

When sampling is complete, tap Quit to exit the form.

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DATA MANAGEMENT

After sampling is done for the day, the data must be backed up on the RDA itself and then transferred (by HotSync) to the netbook.

BACKING UP DATA

After each sample the RDA should be backed up so that data is stored on both of the compact flash drives. Turn the RDA on, and tap the home icon in the bottom portion of the screen to bring up the main menu. Tap the CardBkup icon if it is present, and then the Backup Now button at the top left of the screen. The data will now be on both flash drives. If the RDA does not have a CardBkup icon, it will back up automatically.

DOWNLOADING DATA TO NETBOOK

Connect the communications cable into the RDA and a USB port on the netbook. Press the power button to turn on the RDA and begin a HotSync by tapping the home icon, and then the HotSync icon found on the main menu. Tapping the large icon in the center of the screen will start the HotSync operation (Figure 4). Please make sure the RDA is dry before downloading any data to the netbook.

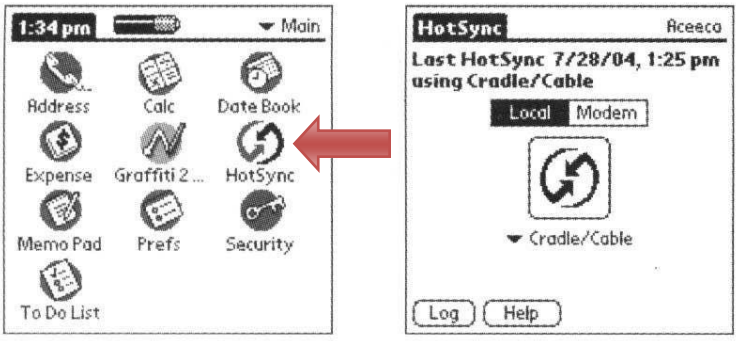

Figure 4.–HotSync Screens Found on RDA.

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EDITING, NAMING, AND SAVING DATA

If a mistake is realized during a sample it is often easiest to document the mistake and send the correction in with the USB flash drive for the Kodiak office to fix. If a mistake is made during the sample it can be changed using the review portion of the form in the RDA. Data can also be changed after it is downloaded onto the netbook, but is not recommended unless the Kodiak office is consulted first. A HotSync operation after changes have been made on the netbook will update the RDA.

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To view data, HotSync the RDA and open Pendragon Forms Manager (a shortcut should be located to the right of the start menu) on the netbook. Select the form (Smolt_2013.XX), and click Edit/View under Data Functions on the right side of the window. All data will now be visible. Simply make the necessary minor changes here and exit out of the window to save. It is important to change the correct the numbers under the proper column which is where it is best to consult the Kodiak office. Hotsync the RDA to the netbook after any changes are made on the netbook to update the RDA with all changes.

After data has been edited and verified, a copy of the database will need to be exported from the Pendragon software and saved on the netbook. In Pendragon Forms Manager under Data Functions on the right side of the window, click To ASCII. Navigate to the folder in which the data is being saved. Type in the file name and then save. The file name should follow this format: Area_Sampled_Smolt_YYYYMMDD.csv (e.g., Afognak_River_Smolt20130614.csv). After saving, a window will pop up stating the file has been created. Each .csv file will contain all of the data that has been collected up to that point in the season. Do not edit or save the .csv file as an excel file or it will be difficult or impossible to upload the data into the database.

TRANSFERRING DATA FROM NETBOOK ONTO USB FLASH DRIVE

Up to date data should be sent into the main office as often as possible (e.g., with the grocery plane). Insert a USB flash drive into an appropriate port on the netbook. Double click on MyComputer, which is found on the desktop of the netbook. Navigate to the folder where your data is saved and highlight the most recent file (determined by the date) by single clicking. With the file highlighted, click on edit at the top of the window and then copy. Open up MyComputer and double click on the USB flash drive (often called "Removable Disk") found under the heading "Devices with Removable Storage." Click on edit at the top of the window, and then paste. The .csv file that was copied earlier will appear in the window indicating it was copied to the flash drive. Exit out of all windows and single click on the safely remove hardware button on the bottom right corner of the desktop in the quick start menu. Click on "Safely remove USB Mass Storage Device." A pop-up will verify that it is now safe to remove the flash drive from the system.

POWERING THE NETBOOK AND RDA

1. The RDA can be charged with either the AC or DC powering options. It is the crew leaders responsibility to keep it charged
2. The netbook can only be charged with the AC power adaptor, therefore plan accordingly for generator use. The charging light on the netbook is red when charging, and green when fully charged.
3. If there are powering problems, please contact the office immediately.

-continued-

SOME NOTES AND REMINDERS

1. Connect the AC adaptor to the bottom of the communications cable to charge the RDA batteries. If using the DC charger, connect the charger into the communications port.
2. If a mistake is noticed before moving onto the next fish, the previous button can be used to make changes in the RDA without having to go to the review screen or alter the data on the netbook.
3. Each length, weight, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been entered correctly.
4. Never put data from different dates onto one slide, and always enter new background information. Even if only one fish is sampled that day, enter new background information and begin with a new slide the next day.
5. Responsibility for accuracy lies first with the primary data collector(s) and finally with the crew leader. Sloppy or incomplete data or slides will be returned to individual collectors for correction.
6. Ensure that all equipment is well kept. Electronics should be stored in a clean safe place. The RDA must be completely dry before transferring data to the netbook. RDA batteries must be charged to make certain sampling is not hampered. It is the responsibility of the crew leader to make sure that all data is carefully examined and before returning it to their supervisor.

TROUBLESHOOTING

RESETTING THE RDA

If problems are encountered with the RDA, a soft reset can be done without losing data. To perform a soft reset hold the power and backlight button down together, and release at the same time. If a soft reset does not work, the office should be contacted about other options for resetting.

Press and release Power and Backlight button together

HOTSYNC ERROR MESSAGE

HotSync message "Exceeded user storage space limit of 500KB in form 'Smolt_2013.XX'

1. Open Pendragon Forms Manager
2. Under Form Function click on "Properties"
3. Click on "Advanced Properties"
4. Click on the "Synchronization Tab"
5. Change the Storage Limit (KB) to 5000 instead of 500.
6. Click "OK"
7. Under Form Functions Click on "Distribute"

APPENDIX D. FINFISH TISSUE SAMPLING OF SMOLT FOR DNA ANALYSIS

ADF&G Gene Conservation Lab, Anchorage

I. General Information

We use fin clip samples from individual fish to determine the genetic characteristics and profile of a particular run or stock of fish. The most important thing to remember in collecting samples is that **only quality tissue samples give quality results**. If sampling from recently moribund smolt: tissues need to be as "fresh" and as cold as possible, do not sample from fungal fins.

Sample preservative: Ethanol (ETOH) preserves tissues for later DNA extraction without having to store frozen tissues. Avoid extended contact with skin.

II. Supplies included with sampling kit:

1. (1) Nail clipper - used for cutting the fin clip
2. Cryovials - small (2ml) plastic vials; pre-labeled.
3. Caps – with or without gasket to prevent evaporation of ETOH.
4. Cryovial rack- white plastic rack with holes for holding cryovials while sampling
5. Ethanol (ETOH) – in bulk Nalgene bottle
6. Squirt bottle – to fill or "top off" each cryovial with ETOH. Squirt bottle not for ethanol storage.
7. Printout of sampling instructions
8. Laminated "return address" label

III. Sample procedure:

Tissue type: Fin clip tissue types will be determined and collected based on smolt overall size. **NO adipose fin.** See page 3 of this appendix for more info on fin clips.

Non-lethal sampling: pelvic fin clip samples will be taken from smolt **> 100mm** in size.

Only one pelvic fin clip per fish per vial.

Lethal sampling: two size categories **65-100mm** and/or **< 65mm** in size to provide ample tissue/ethanol ratio for quality tissue preservation. Use a high dose of MS-222 (approximately 100 mg/L for 10 min) to euthanize lethally-sampled smolt. **Always wear latex gloves when handling MS-222**. Clip ½ caudal fin clip per smolt (65-100mm in size) or clip the entire caudal fin from smolt (< 65mm) in size as shown in diagram provided.

1. Select smolt randomly, without regard to size.
2. Prior to sampling, fill the cryovials half way with ETOH from the squirt bottle. Fill only the cryovials that you will use for a particular sampling period.
3. To avoid any excess water or fish slime in the cryovial, wipe the selected fin dry prior to sampling. Using the dog toe nail clipper or scissors, make the fin clip **1/2 -1" max** to fit into the cryovial.

4. Place fin clip into ETOH. The tissue/ethanol ratio should be **slightly less than 1:3** to thoroughly soak the tissue in the buffer.
5. Top up crovials with ETOH and screw cap on securely. Invert tube twice to mix ETOH and tissue. Between samples, wipe the dog toe nail clippers or scissor blade so not to cross contaminate samples.
6. Data to record: Record each cryovial number so individual tissue samples correlate with additional data being collected.
7. Discard or store remaining ethanol from the 500ml bottle before returning samples. **Tissue samples must remain in 2ml ethanol** after sampling. HAZ-MAT paperwork will be required for return shipment. Store cryovials containing tissues at cool or room temperature, away from heat in the white sample boxes provided. In the field: keep samples out of direct sun and rain and store capped vials in a dry, cool location. Do not freeze samples.
8. Notify laboratory staff and the project biologist when samples are shipped.

IV. Shipping: HAZMAT paperwork is required for return shipment of these samples and is included in the kit.

Return shipping code: 11340643-11340643

Smolt Stage

<u>Ship samples to:</u>

ADF&G – Genetics Lab staff: 1-907-267-2247

333 Raspberry Road Judy Berger: 1-907-267-2175

Anchorage, Alaska 99518 Chris Habicht: 1-907-267-2169

-continued-

ADF&G Gene Conservation Laboratory, Anchorage

Non-lethal finfish tissue sampling of sockeye salmon smolt

(>100mm)

Lethal finfish tissue sampling of sockeye salmon smolt

(65-100mm)

(< 65mm)

Smolt Stage

Non-lethal sampling: one category **(> 100mm).** Clip off only **one pelvic** and put fin clip into pre-filled ETOH cryovial (shown above). **Only one fin clip per fish per vial.**

Lethal sampling: two size catagories **(65-100mm)** and/or **(< 65mm)**. Clip off ½ caudal fin or the entire caudal fin (shown above) necessary to maintain 1:3 tissue/ethanol ratio for tissue quality.

Select sockeye smolts for tissue sampling randomly, without regard to size or position in rotary screw fish traps. **NO** adipose fin ("fatty tissue").

APPENDIX E. LIMNOLOGY & BEACH SEINE SAMPLING COORDINATES AND TENTATIVE SAMPLING SCHEDULE

Appendix E1.–Location of limnology and beach seine sites in Black and Chignik lakes, 2012.

Area	Description	Site/station	Latitude (N)	Longitude (W)
Chignik Lake	Limnology	1	56.239	-158.814
		2	56.256	-158.825
		3	56.269	-158.844
		4	56.289	-158.890
Chignik Lagoon	Beach Seine	1	56.271	-158.674
		2	56.286	-158.605
		3	56.340	-158.492
		4	56.279	-158.644
Black Lake	Limnology	1	56.453	-158.995
	Beach Seine	1	56.413	-158.936
		2	56.453	-158.960
		3	56.448	-158.960
		4	56.452	-158.953
		5	56.437	-158.970

Note: Coordinates are in degrees and decimals. All coordinates in datum WGS-84.

Appendix E2.–Chignik smolt season schedule guide for sampling.

	May	June	July	August
Week 1	Traps Fishing MR	MR WS Bear	WS Bear Traps Removed	Office
Week 2	MR BS Lagoon	MR BS Lagoon	WS Chignik BS Lagoon WS Black	Office
Week 3	MR Buoys Placed WS Chignik	MR WS Chignik WS Black	Office	WS Bear WS Black WS Chignik
Week 4	MR WS Black	MR	Office	Office

Conventions:
BS = Beach Seining
MR = Mark-Recapture Experiment
WS = Water sample/Limnology

APPENDIX F. PROPOSED CREW WORK SCHEDULE

Appendix F1.–Proposed crew work schedule for the Chignik Smolt Enumeration Project.

Employee	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
FB I	0015 - 0415 2200 - 2300 **5**	0015 - 0415 1200 - 1400 2200 - 2300 **7**	0015 - 0415 1200 - 1400 2100 - 2300 **8**	0015 - 0415 1200 - 1400 **6**	0015 - 0415 1200 - 1400 2200 - 2300 **7**	0015 - 0415 1200 - 1400 **6**	0015 - 0415 1200 - 1300 **5**
FWT II	0015 - 0415 1200 - 1300 **5**	0015 - 0415 1200 - 1400 **6**	0015 - 0415 1200 - 1400 2100 - 2300 **8**	0015 - 0415 1200 - 1400 2200 - 2300 **7**	0015 - 0415 1200 - 1400 **6**	0015 - 0415 1200 - 1400 2200 - 2300 **7**	0015 - 0415 2200 - 2300 **5**
Activities	Trap Check *BS/Limno	Sample	Sample Dye Test	Sample	Sample	Sample	Trap Check

This schedule is provided as an example of work hours during peak emigration. Actual work hours will vary depending on emigration needs.

Employee	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
FB I	0800 - 0900 1200 - 1300 2200 - 2300 **3**	0800 - 0900 1200 - 1400 2200 - 2300 **4**	0800 - 0900 1200 - 1400 2100 - 2300 **5**	0800 - 0900 1200 - 1400 **3**	0800 - 0900 1200 - 1400 2200 - 2300 **4**	0800 - 0900 1200 - 1400 **3**	 **0**
FWT II	 **0**	0800 - 0900 1200 - 1400 **3**	0800 - 0900 1200 - 1400 2100 - 2300 **5**	0800 - 0900 1200 - 1400 2200 - 2300 **4**	0800 - 0900 1200 - 1400 **3**	0800 - 0900 1200 - 1400 2200 - 2300 **4**	0800 - 0900 1200 - 1300 2200 - 2300 **3**
Activities	Trap Check *BS/Limno	Sample	Sample Dye Test	Sample	Sample	Sample	Trap Check

This schedule is provided as an example of work hours during non-peak emigration. Work week hours should even out between peak and off peak periods.

*Beach Seine (includes AWL sampling) and limnology with water processing days are flexible based on weather. The work hours contribute an additional 5-10 hours/week. When possible, schedule with days off from sccrew trap sampling.

APPENDIX G. TIMESHEET INSTRUCTIONS

Appendix G1.–Instructions for filling out a timesheet.

All ADF&G employees must fill out a timesheet twice per month and these timesheets must be turned in to the Administrative staff in Kodiak in a timely manner. Please follow these instructions when filling out your timesheets to avoid payroll problems. Timesheets will be either emailed or faxed to the project biologist. Fill in the timesheet up to the day you send them in and attempt to project your remaining hours worked.

Fill out each of the following on the top of the timesheet:

Pay period: pay periods start on the 1st or 16th of each month and end on the 15th or end of the month (example: June 1-15 or June 16-30).

SSN: leave blank

Name: full name

Division: Commercial Fish

In the actual timesheet table fill in the following items:

Day: Monday, Tuesday, etc.

Date: 6/16, 6/17, etc.

Hours worked box: start and stop time in military time.

Code 1: fill in the number of hours worked for that day (see example in Appendix G2).

Work hours and Code 1 Totals should both equal the sum of daily hours worked. If your timesheet is sent in before the end of the pay period, project your time for the remaining days so you can total your columns.

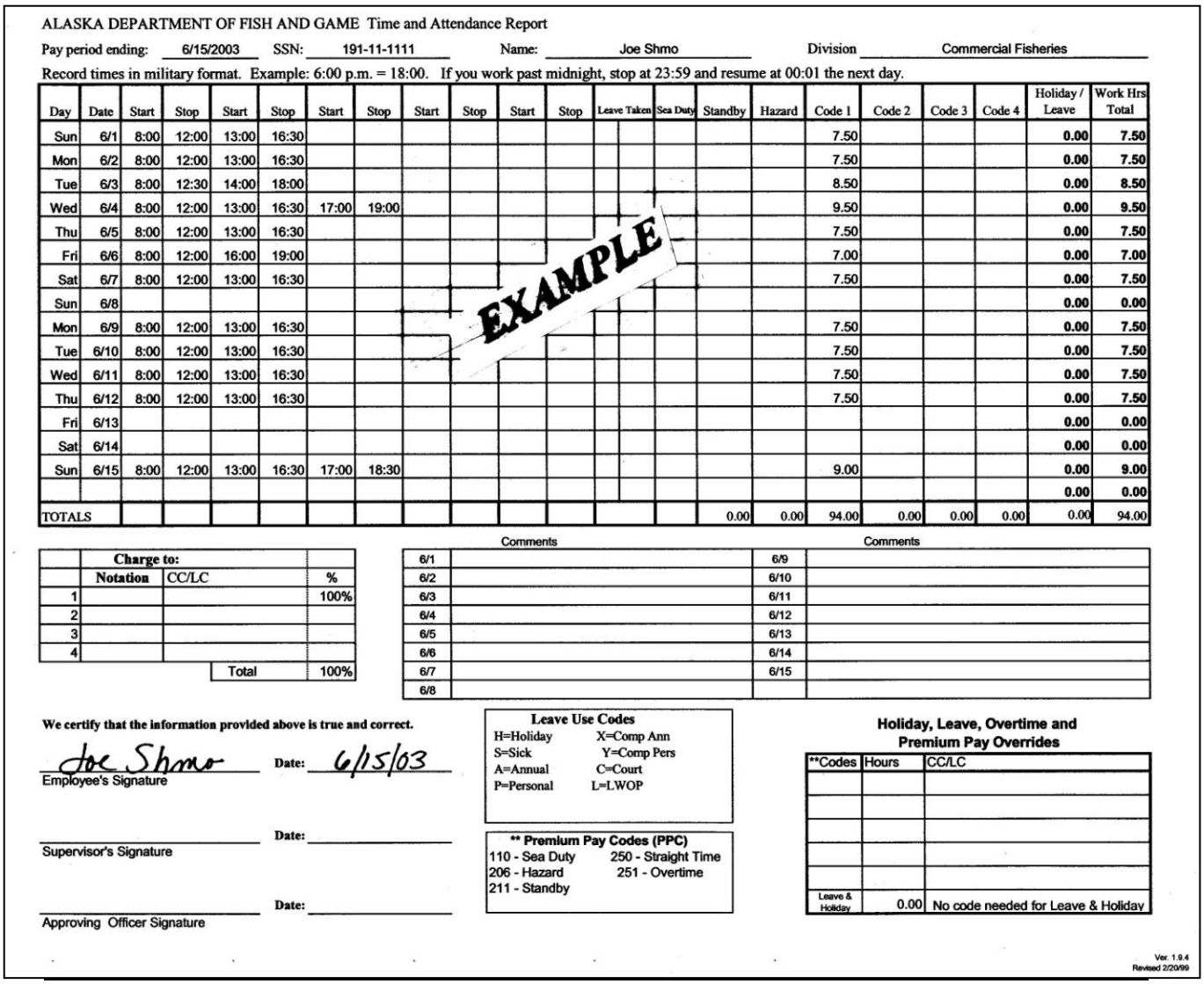
Charge to Table located on the bottom left-hand side of the timesheet should be left blank unless otherwise instructed by your project supervisor.

Comments Table located on the bottom right-hand side of the timesheet should be left blank unless otherwise instructed by your project supervisor.

Employee's signature and date: Be sure to sign and date your timesheet.

Crew leaders are responsible for reviewing each crew member's timesheet before sending them to town to ensure that they are properly filled out.

Appendix G2.–Example of a completed timesheet.



ALASKA DEPARTMENT OF FISH AND GAME Time and Attendance Report

Pay period ending: 6/15/2003 SSN: 191-11-1111 Name: Joe Shmo Division Commercial Fisheries

Record times in military format. Example: 6:00 p.m. = 18:00. If you work past midnight, stop at 23:59 and resume at 00:01 the next day.

Day	Date	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Leave Taken	Sea Duty	Standby	Hazard	Code 1	Code 2	Code 3	Code 4	Holiday / Leave	Work Hrs Total
Sun	6/1	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Mon	6/2	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Tue	6/3	8:00	12:30	14:00	18:00											8.50				0.00	8.50
Wed	6/4	8:00	12:00	13:00	16:30	17:00	19:00									9.50				0.00	9.50
Thu	6/5	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Fri	6/6	8:00	12:00	16:00	19:00											7.00				0.00	7.00
Sat	6/7	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Sun	6/8																			0.00	0.00
Mon	6/9	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Tue	6/10	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Wed	6/11	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Thu	6/12	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Fri	6/13																			0.00	0.00
Sat	6/14																			0.00	0.00
Sun	6/15	8:00	12:00	13:00	16:30	17:00	18:30									9.00				0.00	9.00
																				0.00	0.00
TOTALS														0.00	0.00	94.00	0.00	0.00	0.00	0.00	94.00

EXAMPLE

	Charge to:		
	Notation	CC/LC	%
1			100%
2			
3			
4			
		Total	100%

Comments

6/1		6/9	
6/2		6/10	
6/3		6/11	
6/4		6/12	
6/5		6/13	
6/6		6/14	
6/7		6/15	
6/8			

Comments

We certify that the information provided above is true and correct.

Joe Shmo Date: 6/15/03
Employee's Signature

Date:
Supervisor's Signature

Date:
Approving Officer Signature

Leave Use Codes

H=Holiday	X=Comp Ann
S=Sick	Y=Comp Pers
A=Annual	C=Court
P=Personal	L=LWOP

**** Premium Pay Codes (PPC)**

110 - Sea Duty	250 - Straight Time
206 - Hazard	251 - Overtime
211 - Standby	

Holiday, Leave, Overtime and Premium Pay Overrides

**Codes	Hours	CC/LC
Leave & Holiday	0.00	No code needed for Leave & Holiday

Ver. 1.9.4
Revised 2/20/99

NOTE: every day must be accounted for, even days off. Just leave those days blank for hours

*If worked Standby Duty (e.g. Boat gate duty) put an "x" into Standby column; in comments section write "Standby Duty" and the hours worked as standby for each day worked.

*Each budget code should have 8 digits, no more, no less

*If splitting codes for regular pay and overtime, write the overtime in the bottom right box for Holiday, Leave, Overtime and Premium Pay Overrides. Otherwise your overtime will be coded to your regular pay budget.

*make sure your Code 1 hours (and if applicable Code 2 and Code 3) sum matches the Work Hrs Total sum.